DISCLOSURE NOTICES
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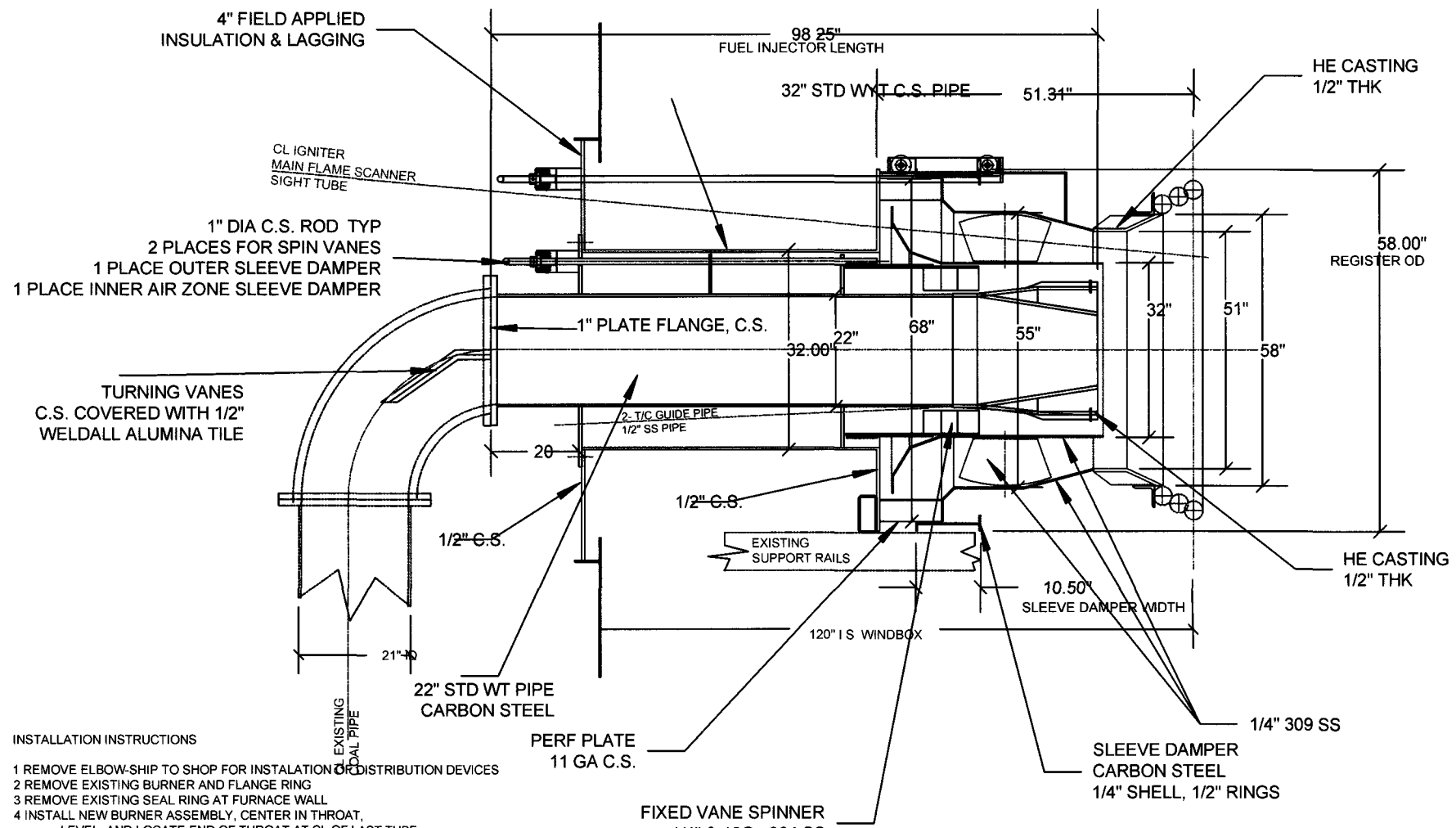
2. THE STRUCTURE AND OPERATION OF THE OPTI-FLOW FUEL DISTRIBUTION SYSTEM AND DUAL REGISTER ARE THE SUBJECT OF ONE OR MORE U.S. PATENT APPLICATIONS.

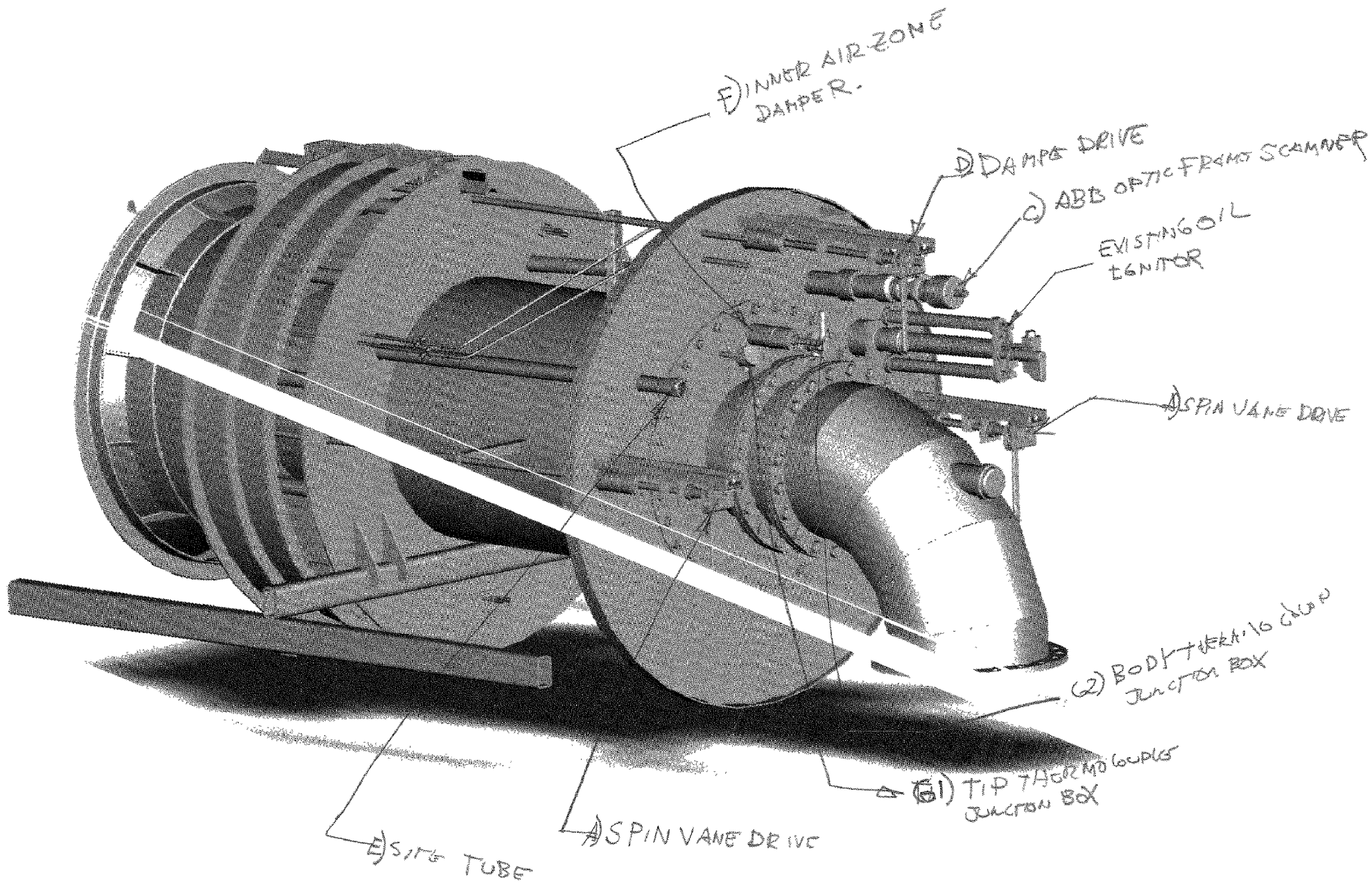


INSTALLATION INSTRUCTIONS

1 REMOVE ELBOW-SHIP TO SHOP FOR INSTALATION OF DISTRIBUTION DEVICES
2 REMOVE EXISTING BURNER AND FLANGE RING
3 REMOVE EXISTING SEAL RING AT FURNACE WALL
4 INSTALL NEW BURNER ASSEMBLY, CENTER IN THROAT, LEVEL, AND LOCATE END OF THROAT AT CL OF LAST TUBE
5 SHIM BETWEEN SUPPORT BAR AND EXISTING RAILS
6 SEAL WELD INSTALATION RING TO WINDBOX
7 INSTALL SEAL RING AND WELD TO WALLBOX
8 INSTALL IGNITERS AND MAIN FLAME SCANNER
9 REINSTALL REWORKED ELBOW

TOLERANCES, UNLESS SPECIFIED	CAD GENERATED DRAWING DO NOT MANUALLY UPDATE	350 MAIN STREET, SUITE 5 HEDMINSTER, NJ 07921	
APPROVALS	DATE	INTERMOUNTAIN POWER SERVICE CORPERATION	
DRAWN CCO	11/15/02	ABT PROPOSIAL NUMBER Q02003	
CHECKED		SIZE B	DWG NO. Q03013-10 REV 0
SURFACE ROUGHNESS NOT TO EXCEED 125		CAD FILE	
BREAK SHARP CORNERS			
DO NOT SCALE PRINT			

IP7_030911


F) INNER AIR ZONE DAMPER.
D) DAMPER DRIVE
C) ABB OPTIC FRAME SCANNER
EXISTING OIL IGNITOR
A) SPIN VANE DRIVE
(2) BODY THERMOCOUPLE JUNCTION BOX
(61) TIP THERMOCOUPLE JUNCTION BOX
A) SPIN VANE DRIVE
E) SITE TUBE

IP7_030912

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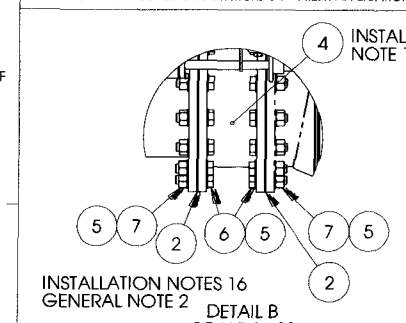
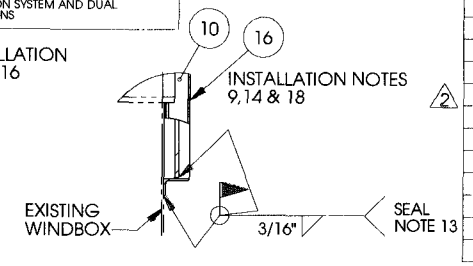
2. THE STRUCTURE AND OPERATION OF OPTI-FLOW FUEL DISTRIBUTION SYSTEM AND DUAL REGISTERS ARE SUBJECT OF ONE OR MORE U.S. PATENT APPLICATIONS

ITEM NO.	QTY.	PART NUMBER	MATERIAL	DESCRIPTION
1	1	03008-100-A03-D0	SEE DRAWING	BURNER SHOP ASSEMBLY
2	15 LF	03008-100-A00-D01	--	BOLT HOLE GASKET TAPE 2" WIDE COMPRESS TO 1/8"
3	1	03008-500-A00-0	SEE DRAWING	VERTICAL FUEL DISTRBUTION ASSEMBLY
4	1	03008-500-A02-D0	SEE DRAWING	HORIZONTAL FUEL DISTRIBUTOR
5	80	FW 1	STEEL	1" FLAT WASHER
6	40	HHBOLT 1 00-8X3.75X1.75-C	GRADE 5 STEEL	1"-8 UNC X 3 3/4" X 1 3/4" THREAD HEAVY HEX BOLT
7	40	HHNUT 1.0000-8-D-C	STEEL	1"-8 UNC HEAVY HEX NUT
8	1	D232666-105	SEE DRAWING	ABB FLAME SCANNER
9	1	03008-100-A03-D07	SEE DRAWING	CROSSOVER SUPPORT (SHIPPED WITH UNIT)
10	1	03008-100-A03-D02	ASTM A36 C.S.	78 1/4" ID X 2 3/4" X 1/4" THK BAR (SHIPPED WITH UNIT)
11	1	03008-100-A03-D09	ASTM A36 C.S.	L 3" X 3" X 5/16" THK ROLLED HW TO 57 1/4" ID (SHIPPED WITH UNIT)
15	2	03008-100-A03-D08	SEE DRAWING	CROSSOVER SUPPORT END GUIDES
16	1	03008-100-A03-D17	SEE DRAWING	MOUNTING SPACER ANGLE



DETAIL B
SCALE 1 : 12



DETAIL C
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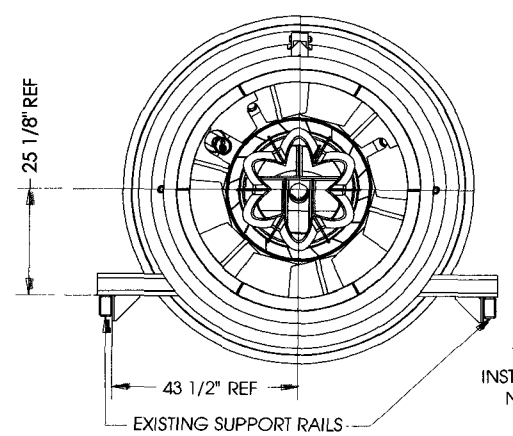

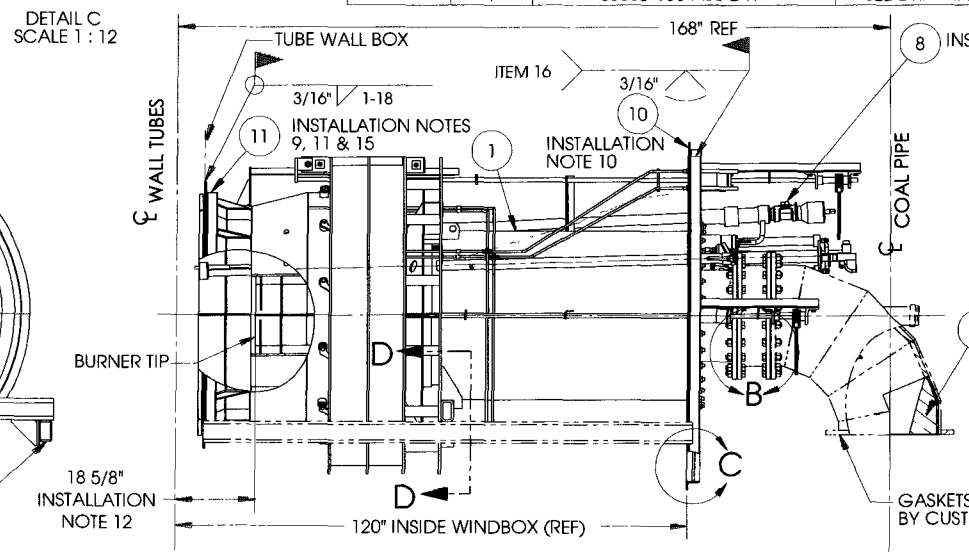

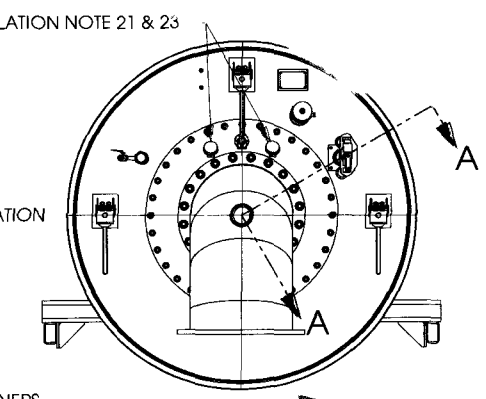

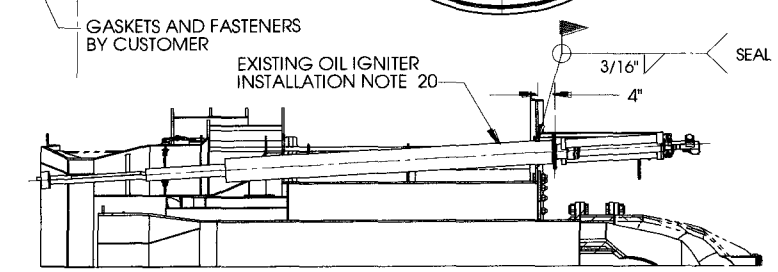

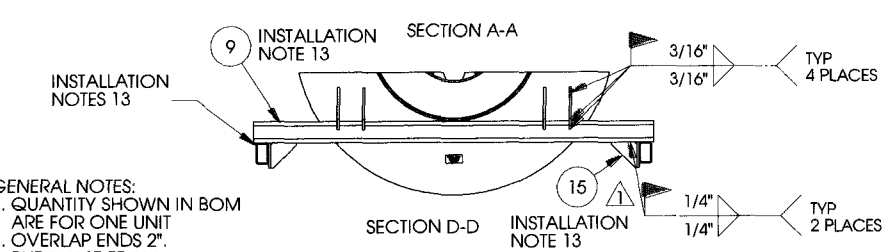

REMOVAL AND INSTALLATION NOTES:

THE FOLLOWING INSTRUCTIONS ARE SUGGESTIONS. THE SEQUENCE MAY BE MODIFIED TO ACCOMIDATE WORK FLOW, EQUIPMENT AVAILABLE, AND SKILL LEVELS OF THE WORKMEN.

UNLESS NOTED OTHERWISE ALL WELDS ARE CARBON STEEL TO CARBON STEEL.

1. REMOVE ELBOW
2. INSTALL VFD ITEM 3 (VERTICAL FUEL DISTRIBUTOR) PER DRAWING 03008-500-A03-0 IN EXISTING ELBOW
3. DISCONNECT SEAL AIR PIPING, OIL AIR LINES AND ALL ELECTRICAL LEADS
4. REMOVE EXISTING SCANNERS, DISCARD.
5. REMOVE EXISTING OIL IGNITER AND SET ASIDE FOR REUSE
6. REMOVE INSULATION AND LAGGING AROUND EXISTING BURNER FRONT PLATE
7. REMOVE EXISTING BURNER AND DISCARD
8. REFERENCE B&W DRAWING 294359E. REMOVE ITEM E AND GRIND WELDS FLUSH TO THE EXISTING CASING WELD RING.
9. BREAK TACK WELDS OF SUPPORT RING, ITEM 10 AND SEAL RING ITEM 11
10. DISCARD ITEM 10 (ROLLED RING) AND REPLACE WITH NEW ANGLE RING ITEM 16, SHIPPED SEPERATLY
11. INSTALL NEW BURNER. SEE DRAWING 03008-100-A01-FW AND 03008-100-A01-RW FOR BURNER LOCATION AND SPIN. ITEM 11 SHOULD BE KEPT IN POSITION ON THE TIP.
12. CENTER BURNER IN FURNACE WALL OPENING AND LEVEL AND PLUMB BURNER. LOCATE TIP PER SIDE VIEW.
13. INSTALL BURNER CROSSOVER SUPPORT ITEM 9 (03008-100-A03-D07) AND SUPPORT END GUIDES ITEM 15 (03008-100-A03-D08), CENTER ITEM 15 ON ITEM 9 TUBING, WELD AS SHOWN IN SECTION D-D. SHIM TO FIT TO EXISTING SUPPORT RAILS. COMPETE WELDING PER SECTION D-D.
14. LOCATE MOUNTING SPACER, ITEM 16, AGAINST WINDBOX WALL. TACK WELD TO WINDBOX AND BURNER FRONT PLATE
15 CENTER ITEM 11 ON THE TIP, AND TACK IN PLACE TO THE EXISTING CASING WELD RING
16. INSTALL COAL ELBOW & HORIZONTAL FUEL DISTRIBUTOR ASSEMBLY PER DETAIL B.
17. THE BURNER CAN BE MOVED UP TO 1/4" IN ANY DIRECTION TO FIT UP WITH THE EXISTING COAL PIPE ATTACHMENT.
18. FINISH WELDING FRONT PLATE AND SUPPORT RING IN PLACE SEE DETAIL "C".
19. INSTALL FLAME SCANNER PER ABB DRAWING:
    902-2491-AA
    STNRD-B232666-107
    STNRD-D232665-025
    STNRD-D232677-002
    STNRD-00-D623232-000-001
20. INSTALL OIL IGNITER PER THIS DRAWING AND B&W DRAWING 294359E
21. INSTALL T/C LEADS PER MANUFACTURERS INSTRUCTIONS.
22. MAKE ALL OIL AND AIR CONNECTIONS
23. MAKE ALL ELECTRICAL CONNECTIONS FOR THERMOCOUPLES, AND MAIN FLAME SCANNER.
24. INSULATE AND LAG BURNER FRONT
25. STROKE ALL OPERATORS TO MAKE SURE THAT THEY FULLY OPEN AND CLOSE WITH NO BINDING.
26 AFTER DRAFT FANS HAVE BEEN STARTED CAREFULLY TIGHTEN ALL PACKING GLANDS TO STOP ANY LEAKS AROUND SHAFTS (DO NOT OVER TIGHTEN) RECHECK ALL OPERATORS FOR MOVEMENT.

GENERAL NOTES:
1. QUANTITY SHOWN IN BOM ARE FOR ONE UNIT
2. OVERLAP ENDS 2". PURCHASE FROM:
   HUNTER SALES CORP
   3338 INDUSTRIAL BLVD.
   BETHEL PARK, PA
   412-833-4333
3. REFERENCE DRAWINGS
   000-100-HANDLING

REV	DATE	DESCRIPTION	BY
2	2/13/2004	REVISED NOTES AND CHANGED BOLT SIZE	RJ
1	1/29/2004	ADDED ITEM 15	RJ

REVISION

CONTRACT NO	PART NO.	QTY
A03008	03008-100-A02-D0 CW	24
A03008	03008-100-A02-D0 CCW	24

EST. WEIGHT: 8901.61 lb
MATERIAL:
SIZE:
TYPE.
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED
CUSTOMER NAME: I.P.S C

TOLERANCES UNLESS SPECIFIED

	MACHINE PARTS	WELD FABRICATED PARTS
UP TO 6" INCL	±0.01.0"	±0.03"
OVER 6" TO 12"INCL	±0.03"	±0.06"
OVER 12" TO 24" INC	±0.05"	±0.09"
OVER 24"	±0.06"	±0.125"

ANGLES=0° 30'
SURFACE ROUGHNESS NOT EXCEED 125
BREAK SHARP CORNERS
DO NOT SCALE PRINT

PLANT NAME: IGS
UNIT: 2

CAD GENERATED DRAWING
DO NOT MANUALLY UPDATE

	NAME	DATE
DRAWN	RJ	1/15/2004
CHECKED		
ENG APPR		
MFG APPR		
Q.A		

ADVANCED BURNER TECHNOLOGIES

OPTI-FLOW BURNER
IGS UNIT 2
FIELD ASSEMBLY

SIZE: C | DWG NO: 03008-100-A02-D0 | REV: 2
SCALE: 1 24 | SHEET: 1 OF 1

IP7_030913

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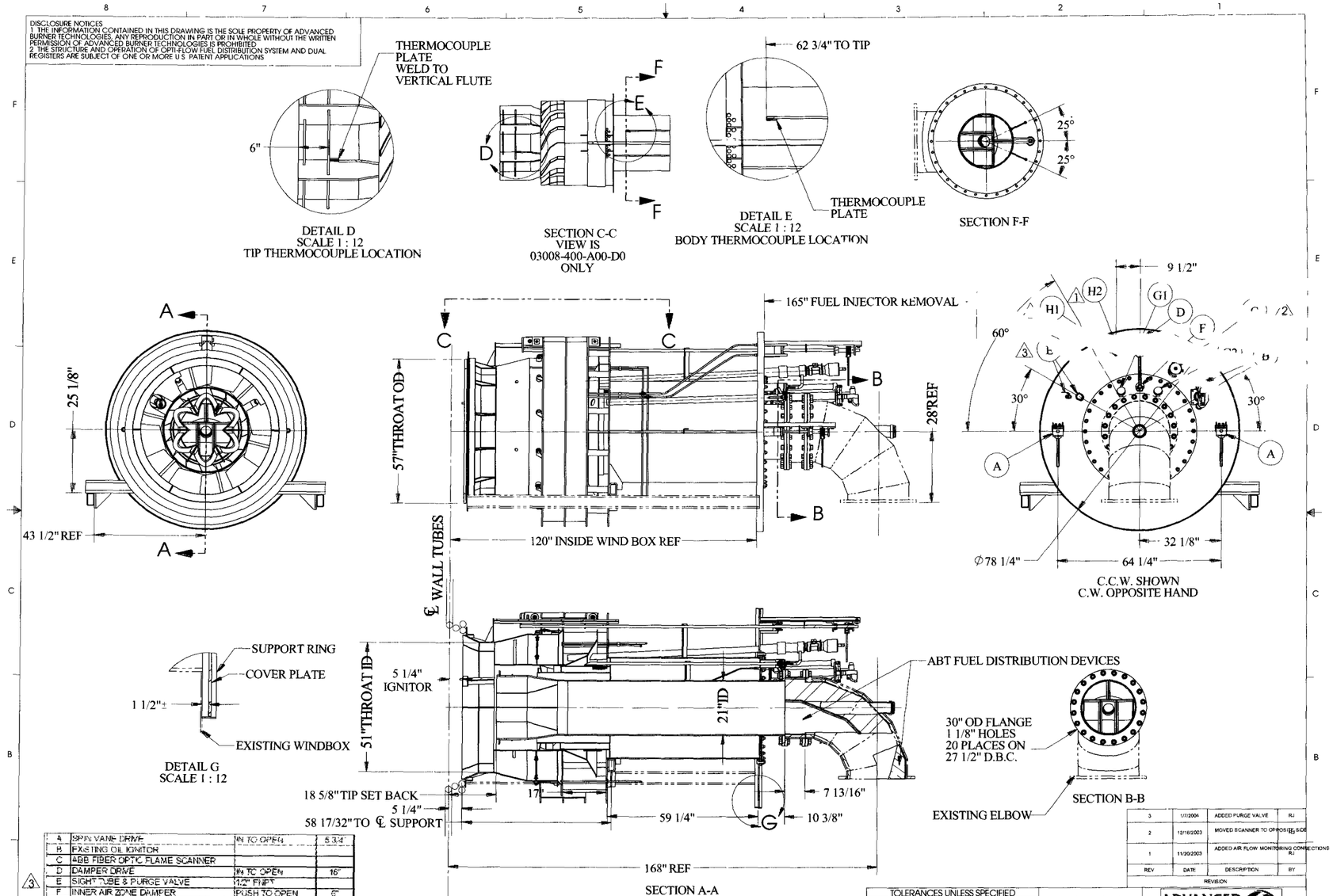

A	SPIN VANE DRIVE	IN TO OPEN	5 3/4"
B	FXS TING OIL IGNITOR		
C	ABB FIBER OPTIC FLAME SCANNER		
D	DAMPER DRIVE	IN TO OPEN	16"
E	SIGHT TUBE & PURGE VALVE	1/2" FNPT	
F	INNER AIR ZONE DAMPER	PUSH TO OPEN	6"
G1	TIP THERMOCOUPLE JUNCTION BOX		
G2	BODY THERMOCOUPLE JUNCTION BOX		
H1	AIR FLOW MONITORING CONNECTIONS	TOTAL PRESSURE	
H2	AIR FLOW MONITORING CONNECTIONS	STATIC PRESSURE	

REV	DATE	DESCRIPTION	BY
3	1/7/2004	ADDED PURGE VALVE	RJ
2	12/16/2003	MOVED SCANNER TO OPPOSITE SIDE	
1	11/20/2003	ADDED AIR FLOW MONITORING CONNECTIONS	RJ

REVISION

CONTRACT NO.	PART NO.	QTY
A03008	03008-100-A00-D0 CW	24
A03008	03008-100-A00-D0 CCW	24

EST WEIGHT. 8829.63 lb.
MATERIAL:
SIZE:
TYPE:
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

CUSTOMER NAME	PLANT NAME	UNIT
I.P.S C.	IGS	2

TOLERANCES UNLESS SPECIFIED

	MACHINE PARTS	WELD FABRICATED PARTS
UP TO 6" INCL	±0.016"	±0.03"
OVER 6" TO 12" INCL	±0.03"	±0.06"
OVER 12" TO 24" INC	±0.05"	±0.06"
OVER 24"	±0.06"	±0.125"

ANGLES ±0° 30'
SURFACE ROUGHNESS NOT EXCEED 125
BREAK SHARP CORNERS
DO NOT SCALE PRINT

CAD GENERATED DRAWING
DO NOT MANUALLY UPDATE

	NAME	DATE
DRAWN	RJ	10/27/2003
CHECKED		
ENG APPR		
MFG APPR		
Q A		

ADVANCED BURNER TECHNOLOGIES

OPTI-FLOW BURNER
IGS UNIT 3
GENERAL ARRANGEMENT

SIZE C | DWG NO 03008-100-A00-D0 | REV 3
SCALE 1:24 | SHEET 1 OF 1

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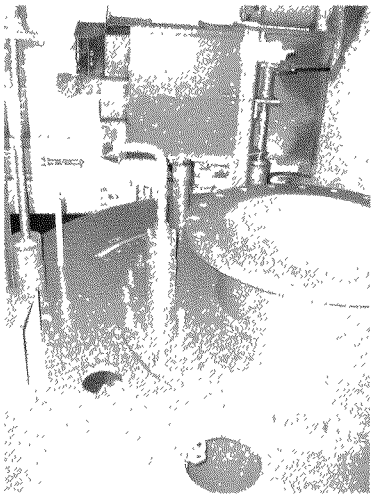

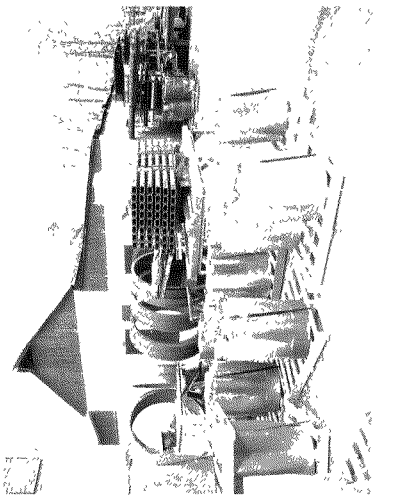
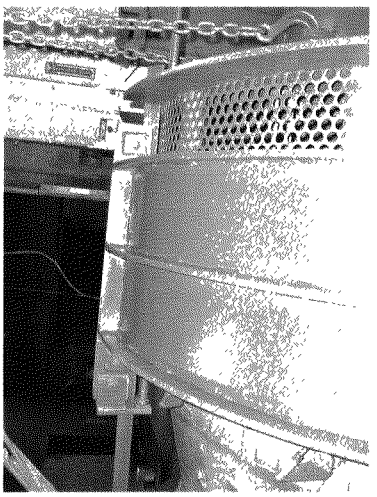
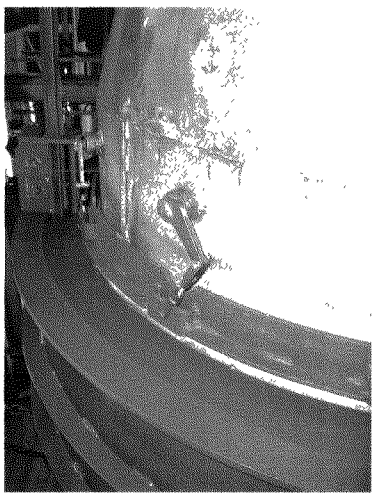
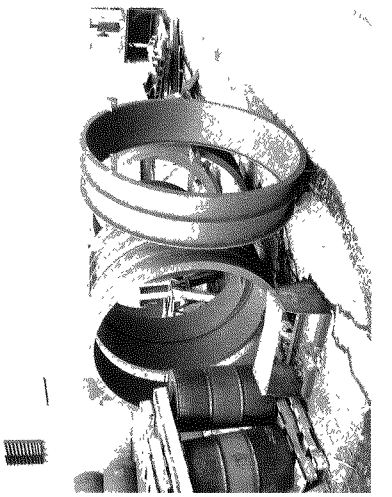
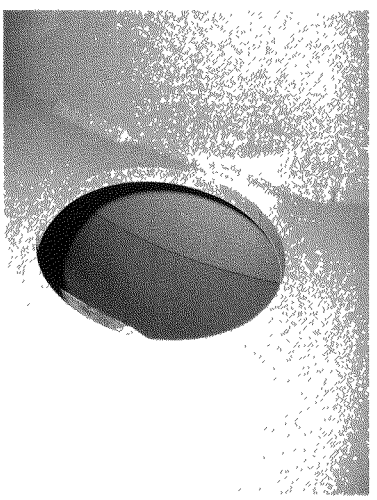

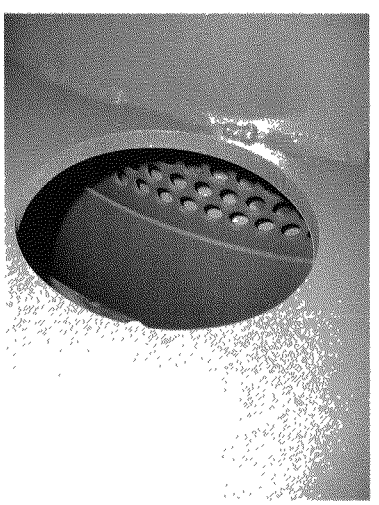
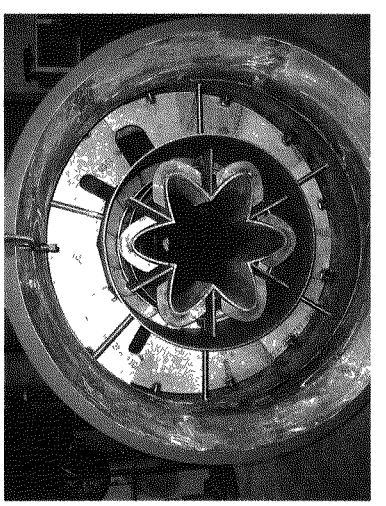

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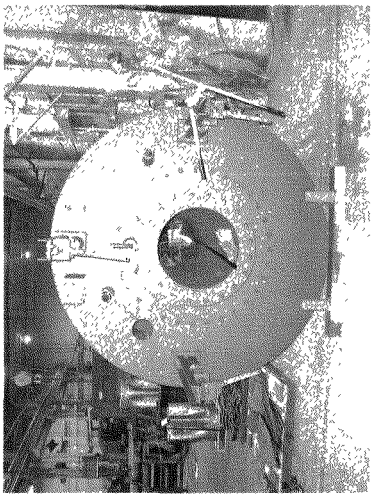

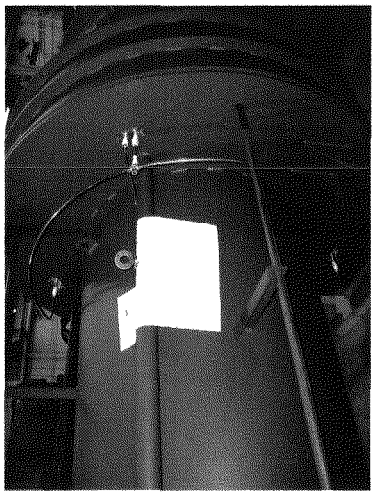

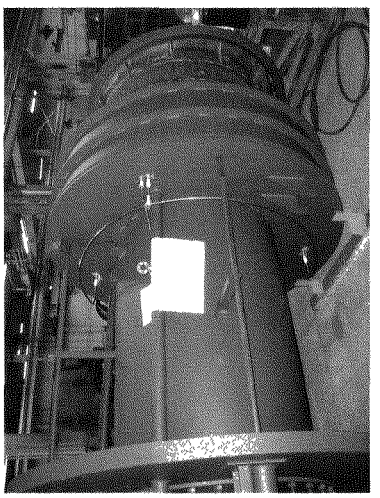

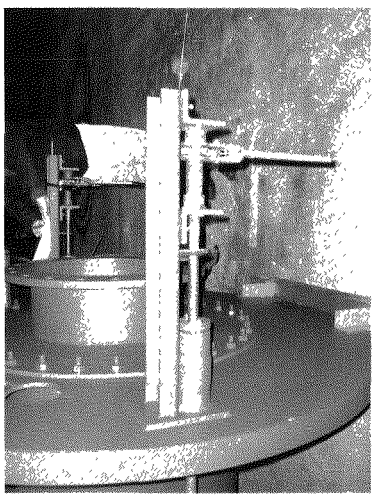

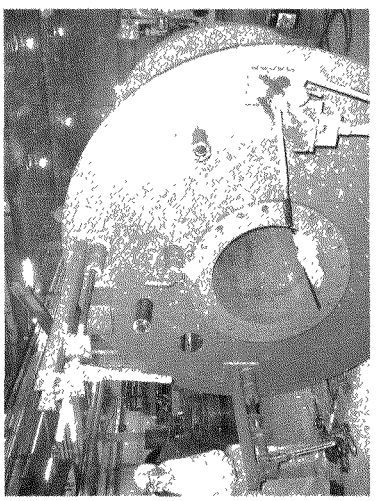

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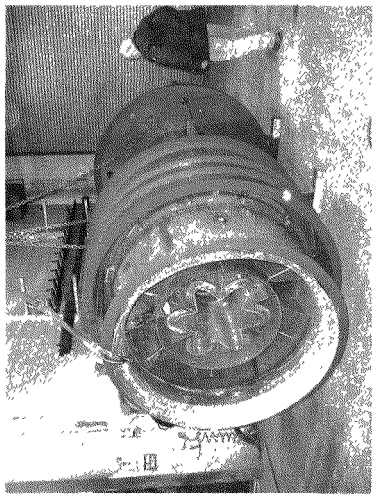

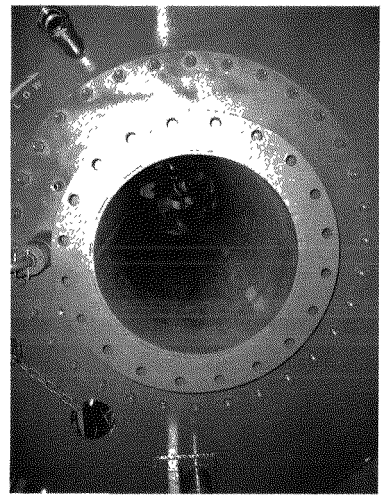
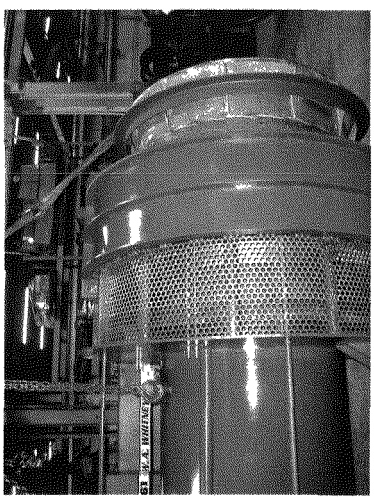

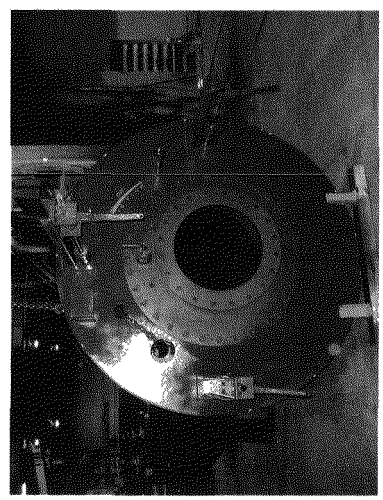
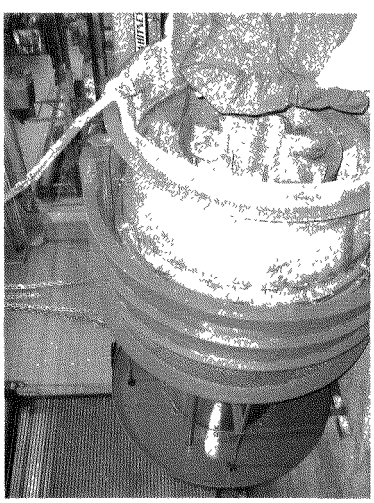

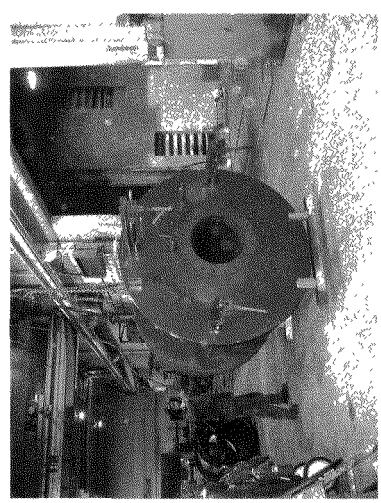
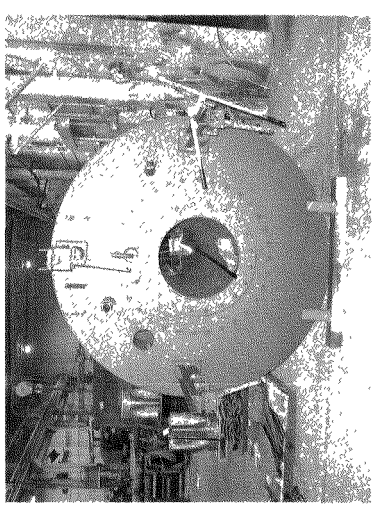
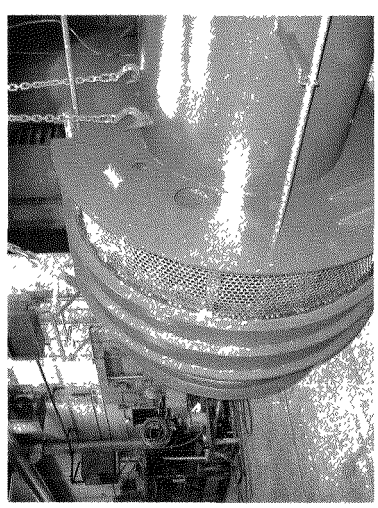
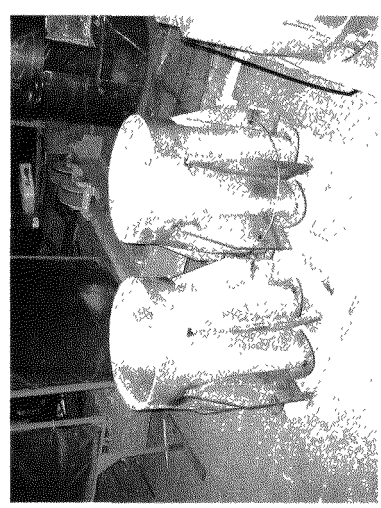

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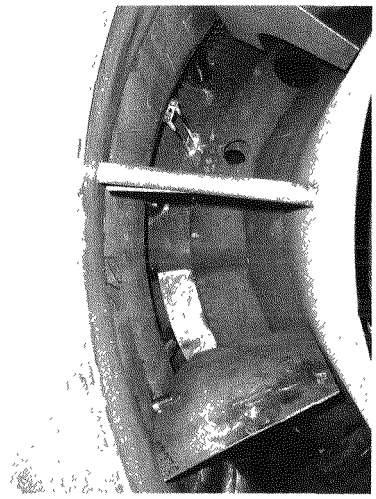
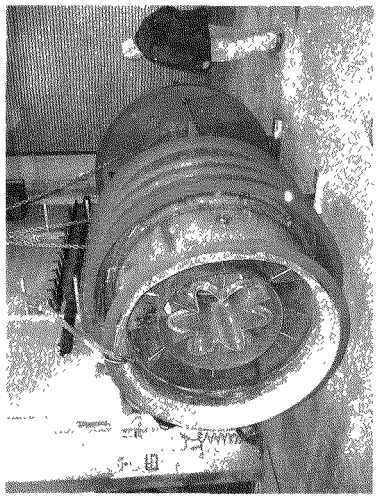
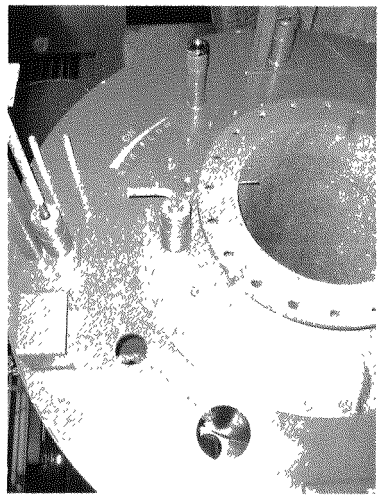
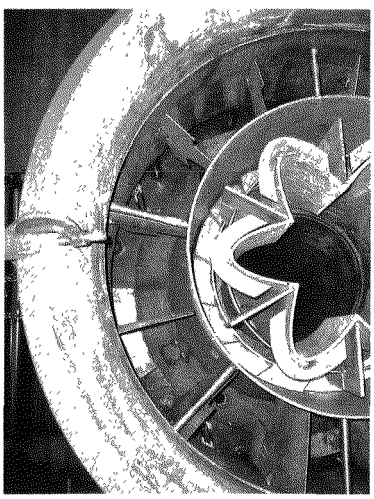
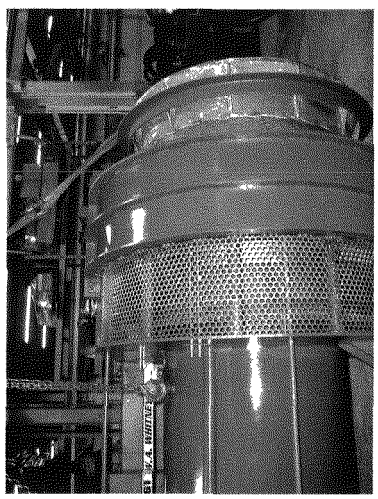
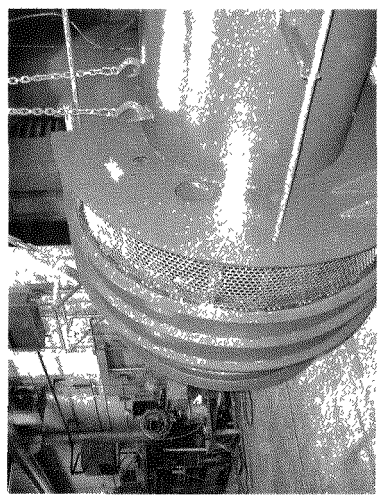
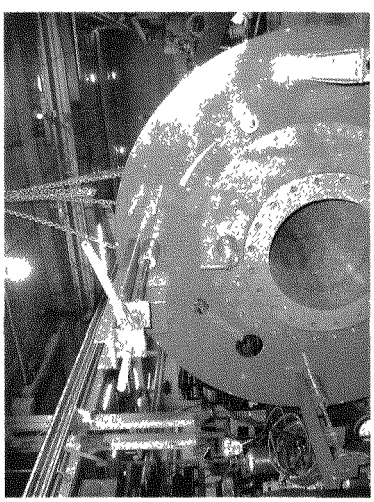
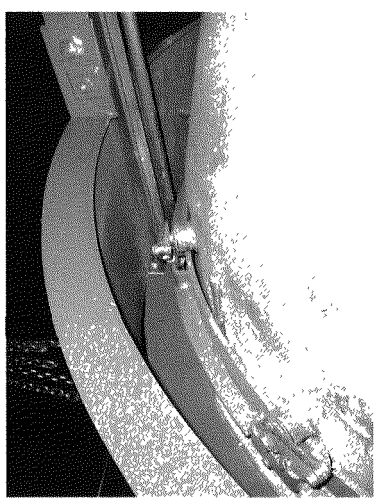
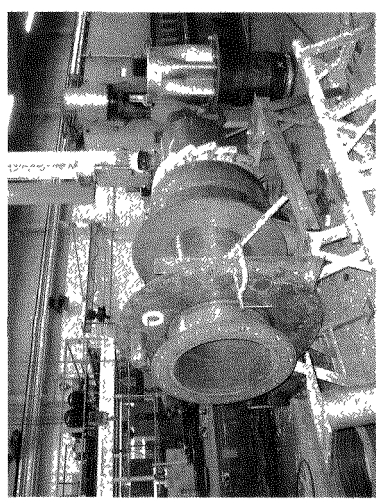
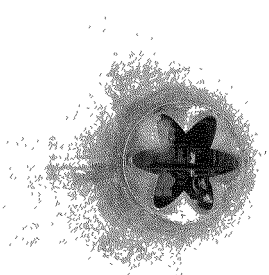
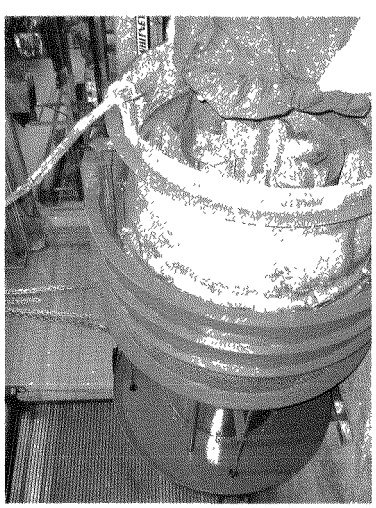
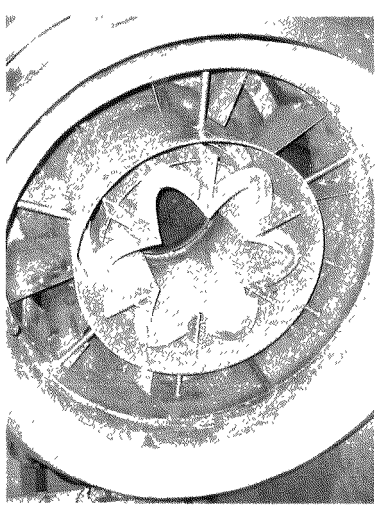

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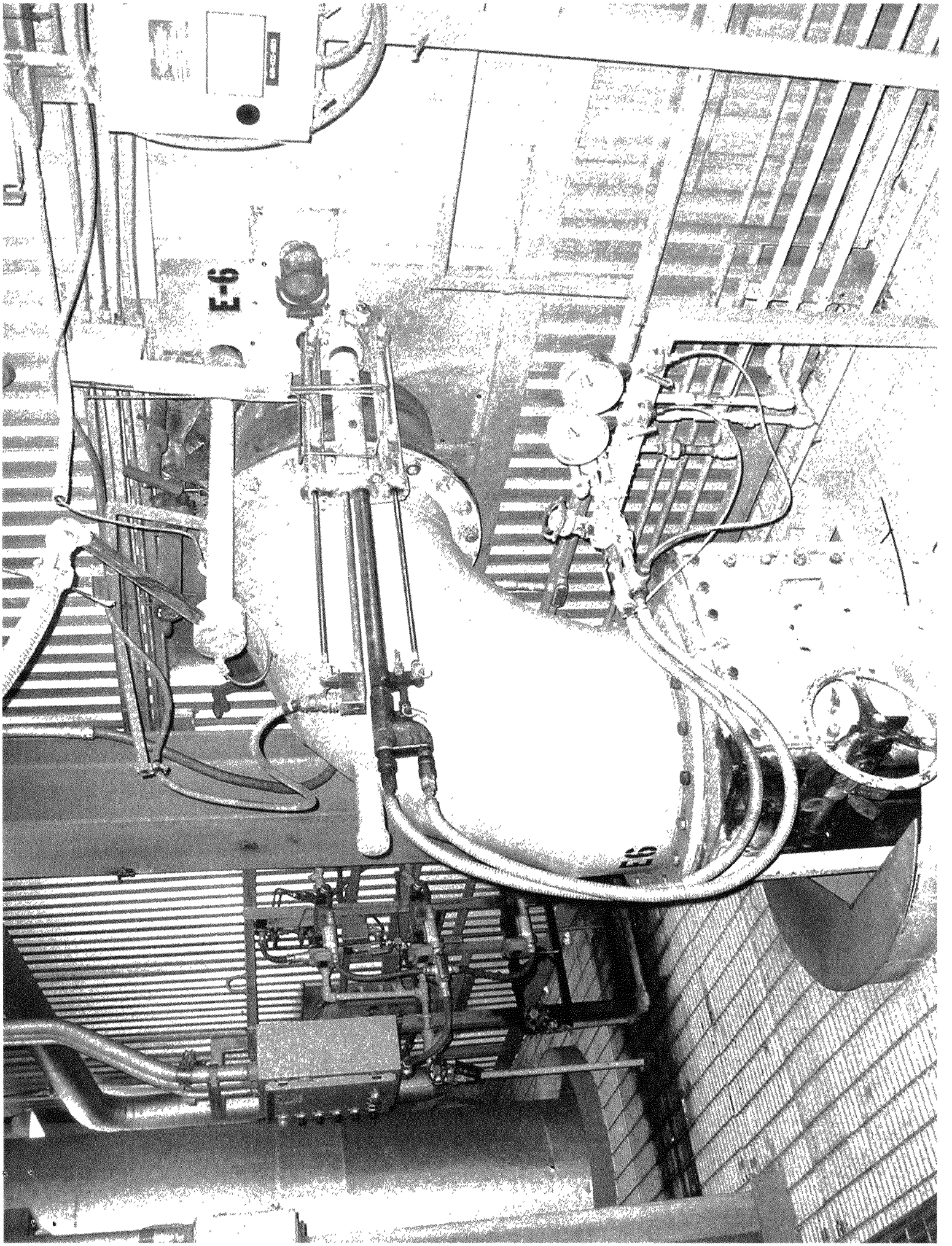

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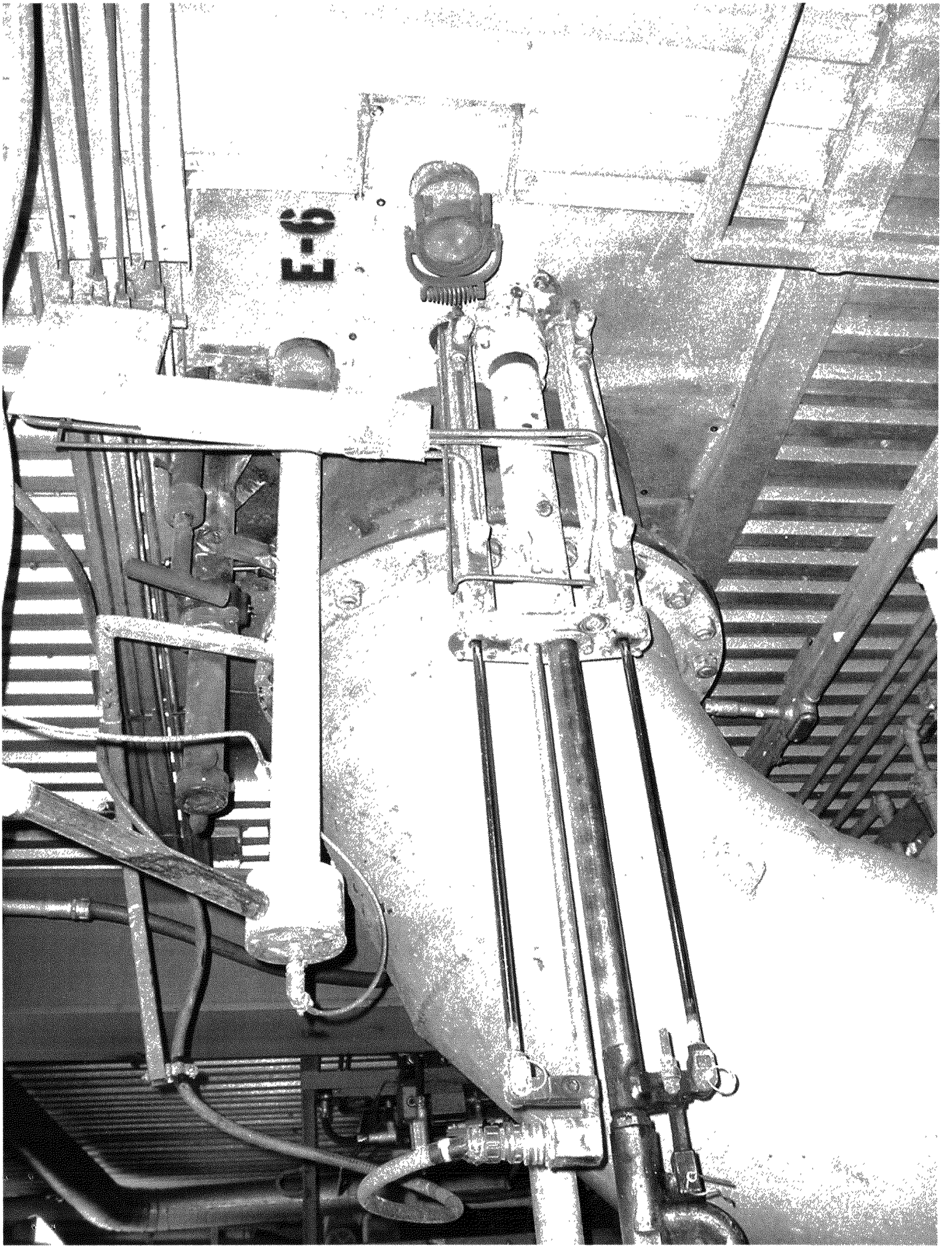

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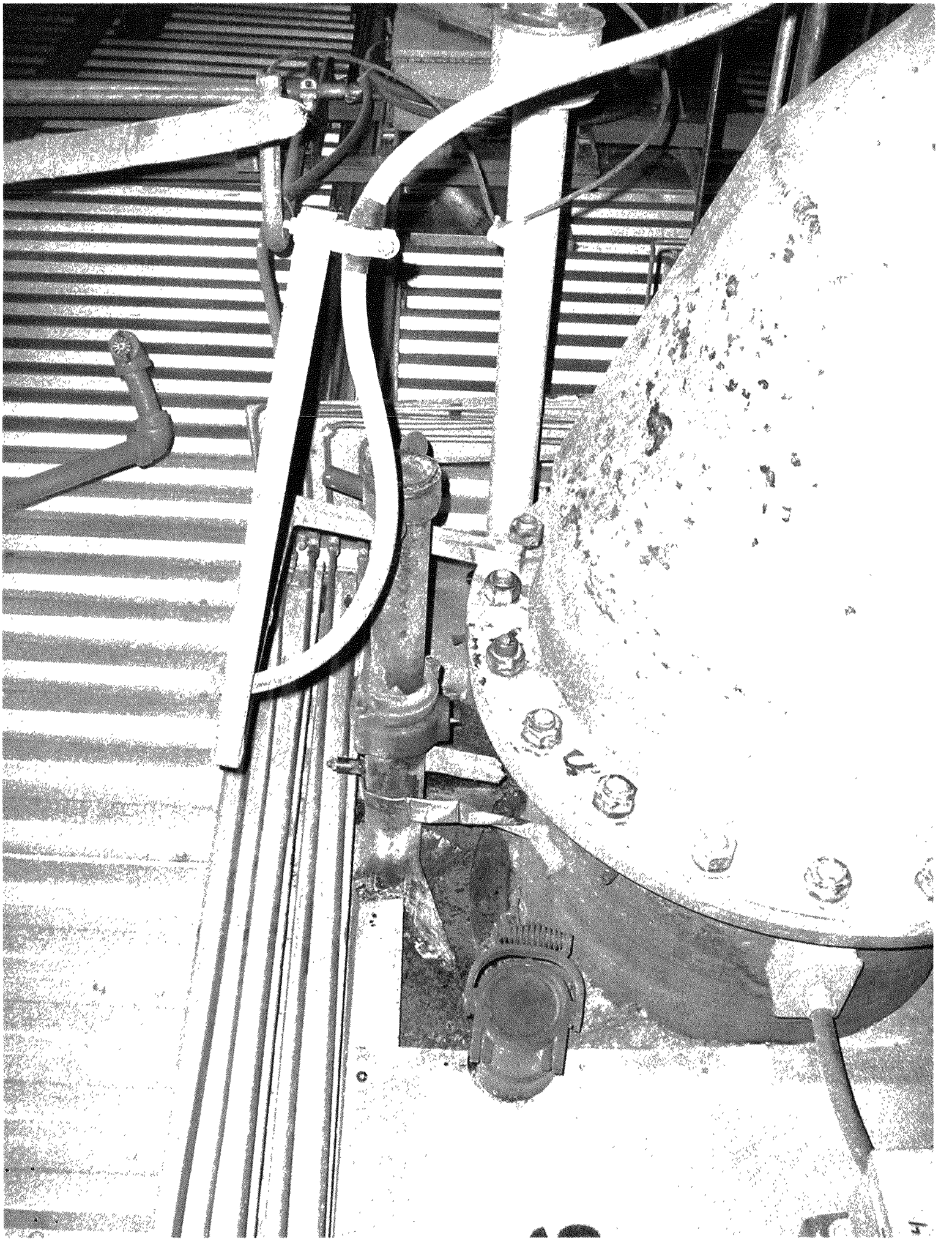

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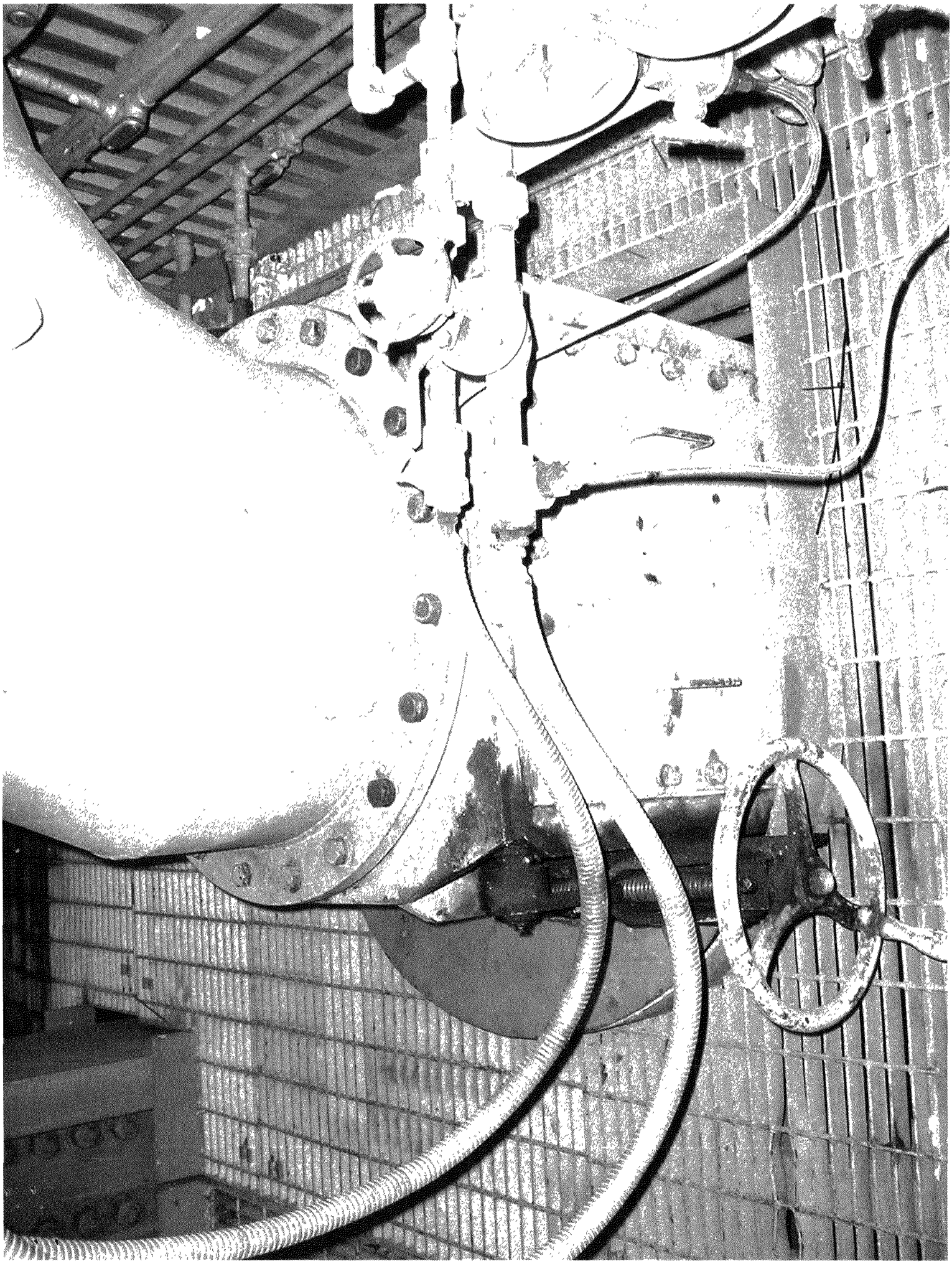

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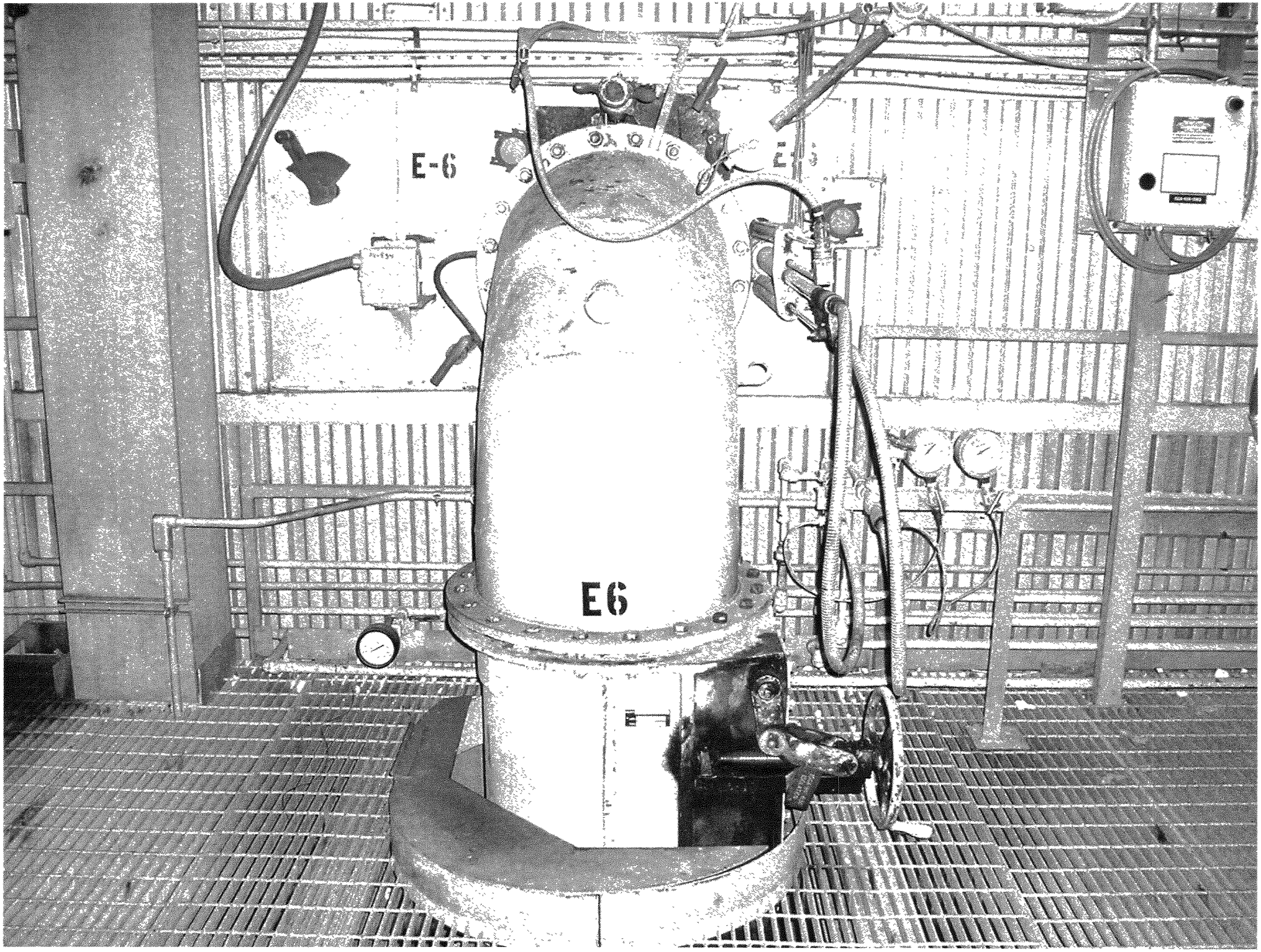

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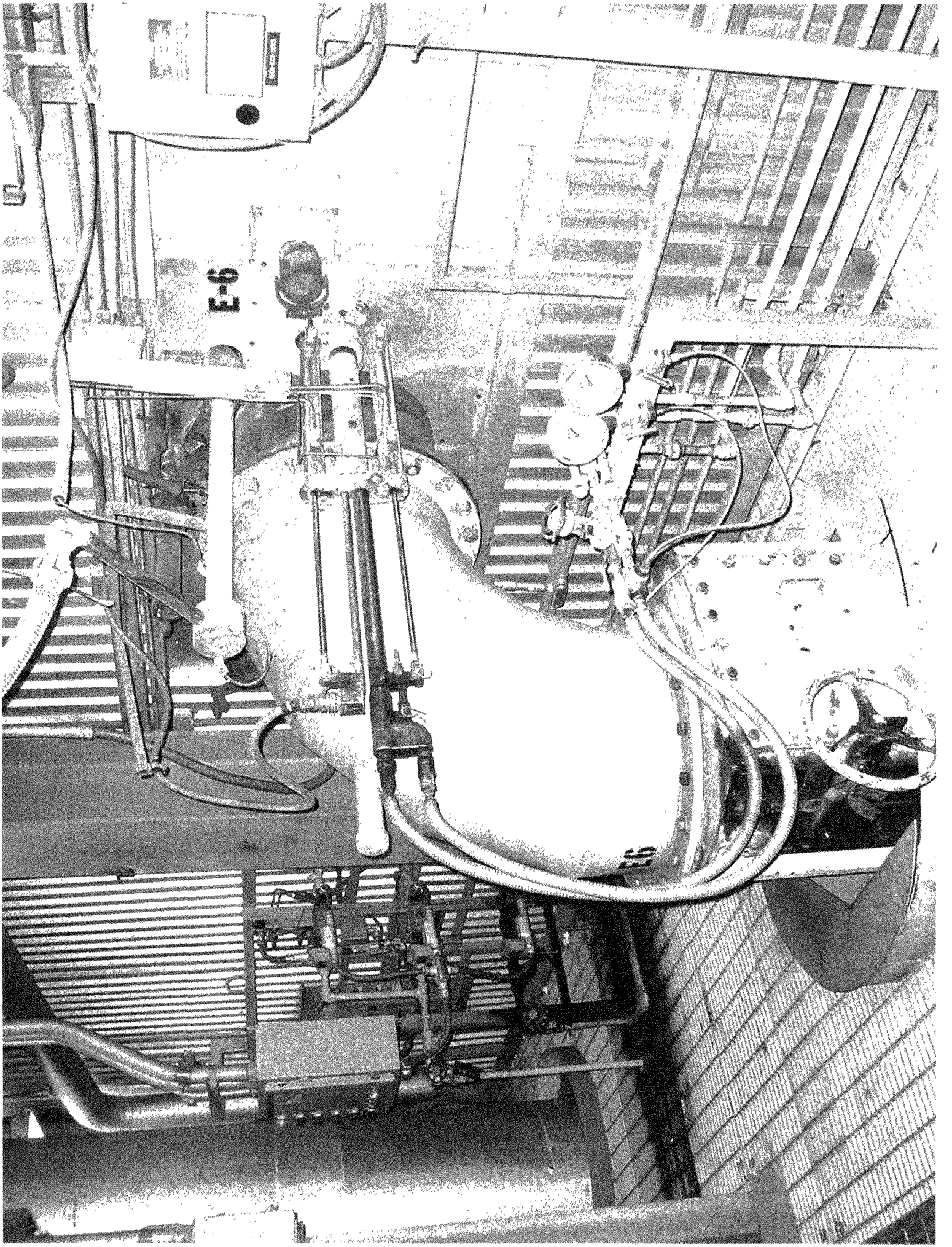

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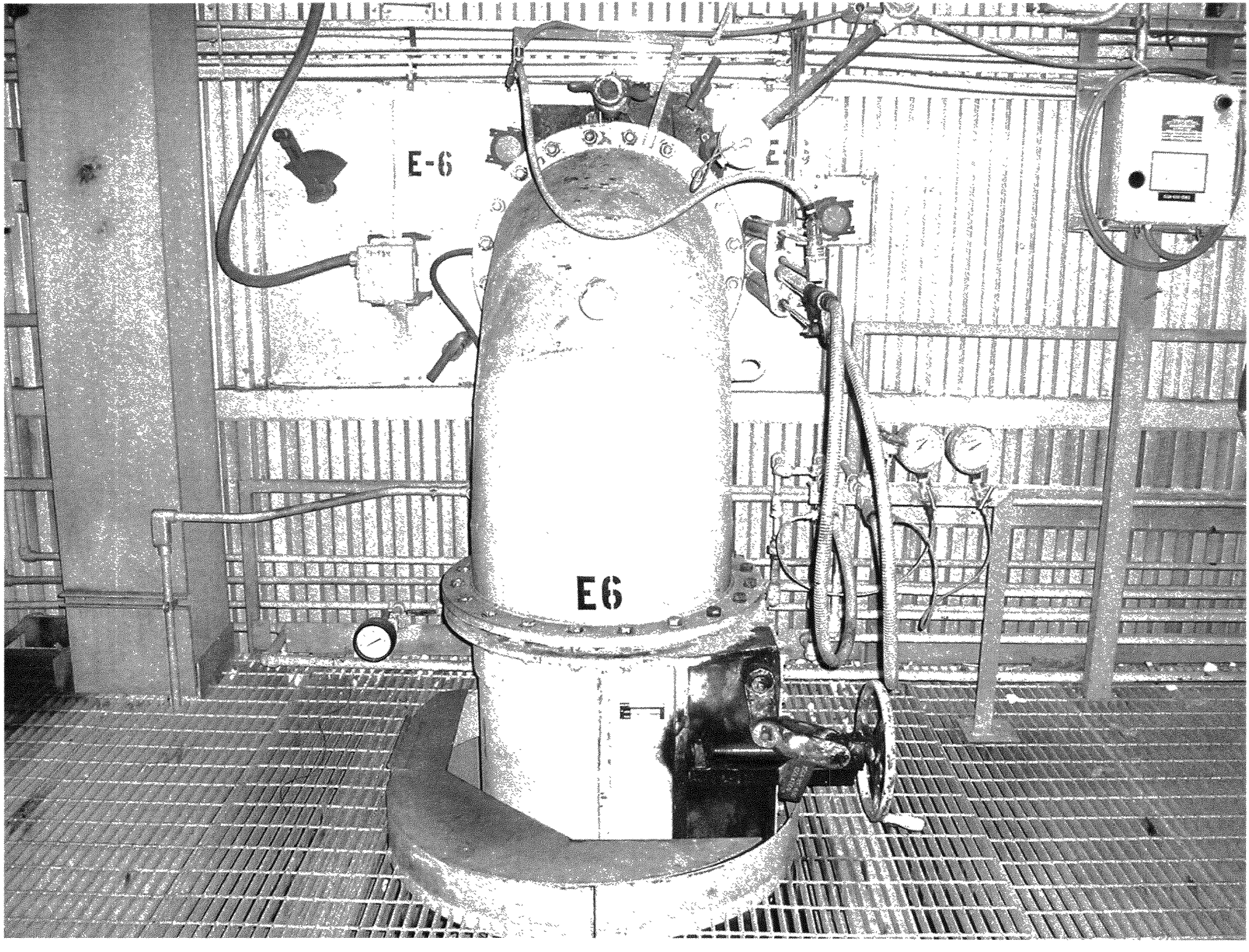

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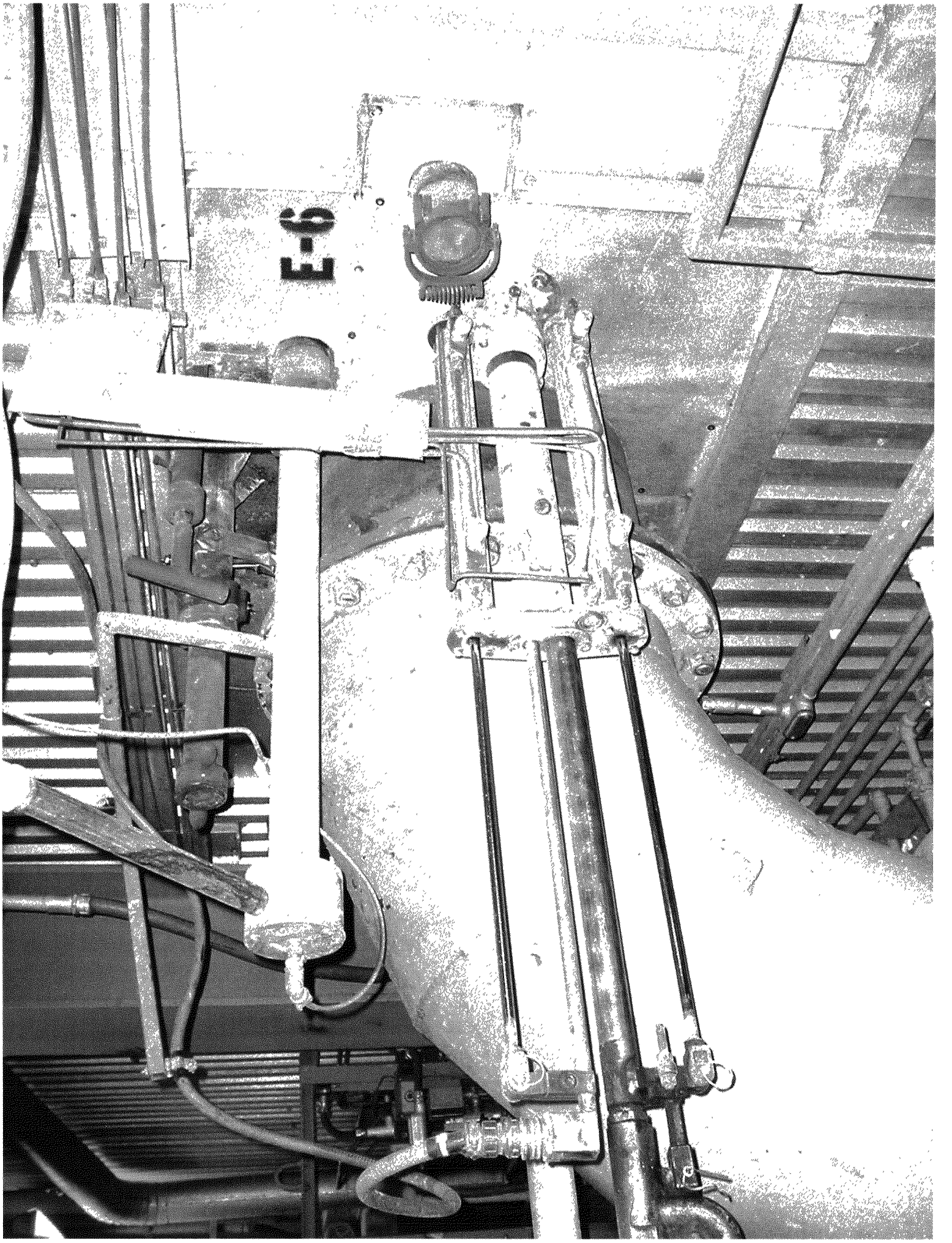

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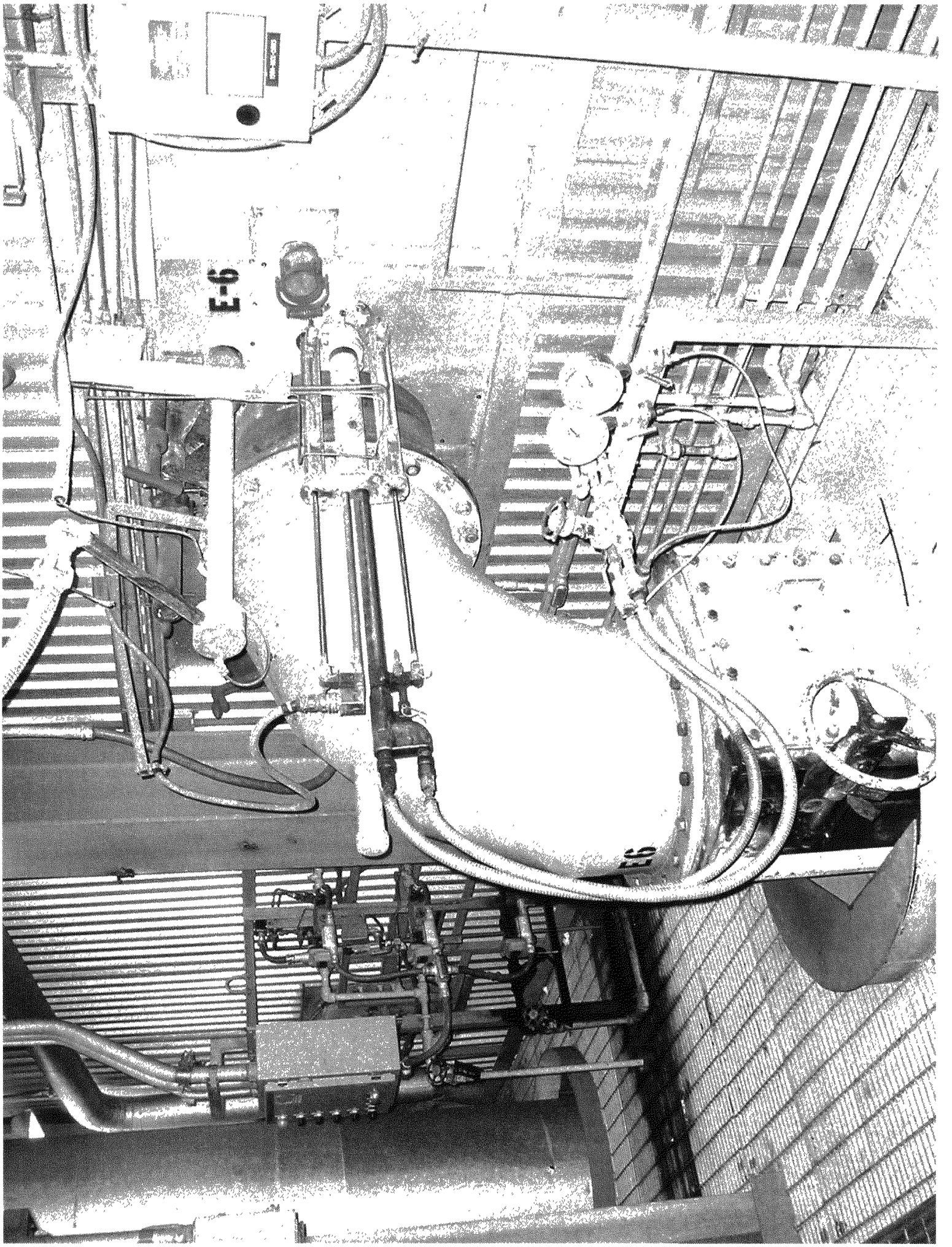

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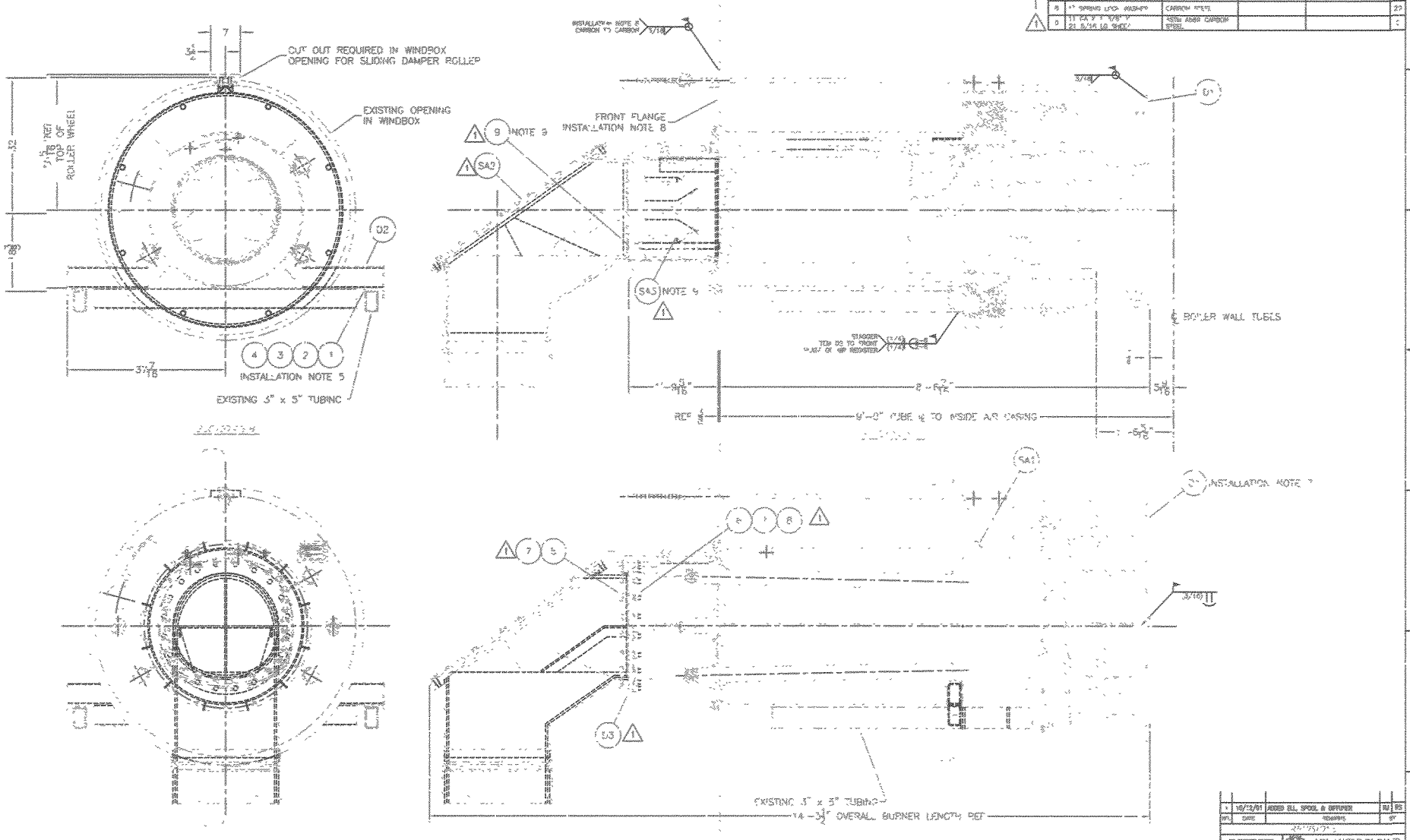
STRUCTURE AND OPERATION OF FLOW FUEL DISTRIBUTION SYSTEM AND DEAL TER ARE SUBJECT OF ONE OR MORE U.S. PATENT APPLICATIONS.

Bill of Material

Item	Description	Material	Drawing Number	Note	Qty
SA1	BURNER SHOP ASSEMBLY	SEE DWG	PR-1061-A1-0		1
SA2	23 DEG ELBOW	SEE DWG	23PA-ELB	BY ABT	1
SA3	23 REDUCER	SEE DWG	23BRFUSER		1
D1	BURNER CASING PANEL	SEE DWG	PR-1061-A1-01		1
D2	BURNER SUPPORT BEAM DETAIL	SEE DWG	PR-1061-A1-02		1
D3	GASKET			BY ABT	1
1	7 / 3 1/2 x 1/4" THK SQ BAR STOCK	ASTM A36 CARBON STEEL		SECTION NOTE 7	4
2	5 / 3 1/2 x 3/8" THK SQ BAR STOCK	ASTM A36 CARBON STEEL		SECTION NOTE 8	4
3	5 / 3 1/2 x 1 1/8" THK SQ BAR STOCK	ASTM A36 CARBON STEEL		SECTION NOTE 5	4
4	5 / 3 1/2 x 1/16" THK SQ BAR STOCK	ASTM A36 CARBON STEEL		SECTION NOTE 8	4
5	1/2-13 UNC x 2" LG. HEX BOLT	SAE GRADE 8			28
6	1/2-13 UNC HEX NUT	SAE GRADE 8			28
7	1" O.D. WASHER	CARBON STEEL			40
8	1" SPRING LOCK WASHER	CARBON STEEL			28
9	11 GA x 1 1/8" V 21 5/16 LG SHEET	ASTM A36 CARBON STEEL			2



REV	DATE	REMARKS	BY
1	10/23/01	ADDED ELL SPOOL & DIFFUSER	RJ

SHEET 2 OF 2

SIZE: SPL BIL OF MATERIAL
TYPE:
DRAWN BY: AED-SWEPCO
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED
DATE: 08/30/01
DRAWN: 08/30/01
ADVANCED BURNER TECHNOLOGIES CORP
OPTIMIZING BURNER
BURNER FIELD EVALUATION
HW PIRKEY POWER PLANT
PR-1061-A1-0

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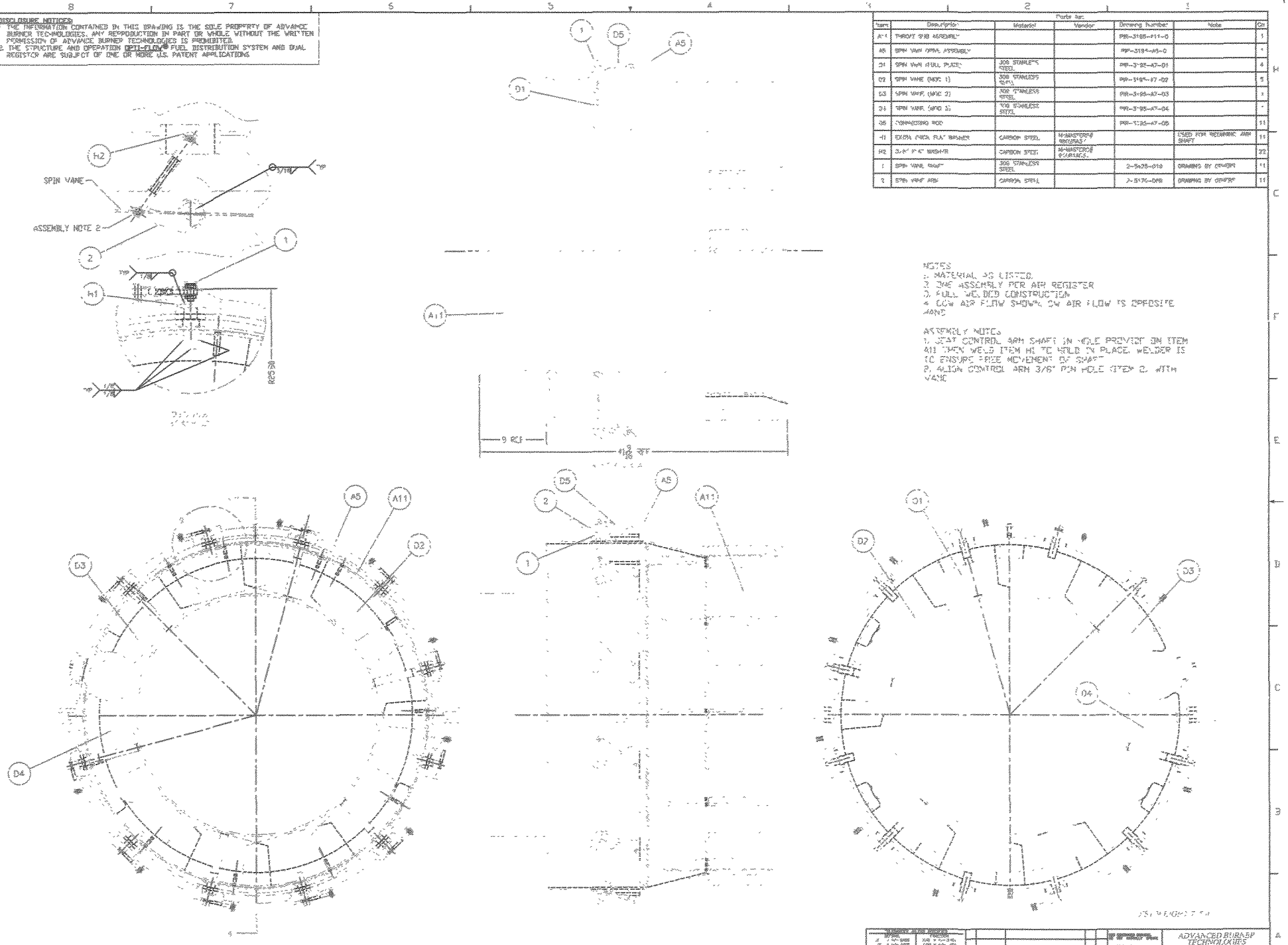
2. THE STRUCTURE AND OPERATION OF THE FLOW® FUEL DISTRIBUTION SYSTEM AND DUAL REGISTER ARE SUBJECT OF ONE OR MORE U.S. PATENT APPLICATIONS

Parts list:

Item	Description	Material	Vendor	Drawing Number	Note	Qty
A-1	THROAT SUB ASSEMBLY			PSR-3195-A1-0		1
A5	SPIN VANE OPEN ASSEMBLY			PSR-3194-A5-0		1
D1	SPIN VANE HUB PLATE	308 STAINLESS STEEL		PSR-3-95-A7-01		6
D2	SPIN VANE (NOT 1)	308 STAINLESS STEEL		PSR-3195-A7-02		5
D3	SPIN VANE (NOT 2)	308 STAINLESS STEEL		PSR-3-95-A7-03		1
D4	SPIN VANE (NOT 3)	308 STAINLESS STEEL		PSR-3-95-A7-04		1
D5	CONNECTING ROD			PSR-3195-A7-05		11
H1	EXTRA CHECK FLAT WASHER	CARBON STEEL	M-MASTER® MINERAS/		USED FOR RETAINING ARM SHAFT	11
H2	3/8" F.W. WASHER	CARBON STEEL	M-MASTER® PLANES.			22
1	SPIN VANE SHAFT	308 STAINLESS STEEL		2-3475-019	DRAWING BY OTHERS	11
2	STOP VANE ARM	CARBON STEEL		2-3176-048	DRAWING BY OTHERS	11



NOTES
1. MATERIAL AS LISTED.
2. ONE ASSEMBLY PER AIR REGISTER
3. FULL WELDED CONSTRUCTION
4. FLOW AIR FLOW SHOWN. CW AIR FLOW IS OPPOSITE WAYS

ASSEMBLY NOTES
1. SEAT CONTROL ARM SHAFT IN HOLE PROVIDED ON ITEM A11 THEN WELD ITEM H1 TO HOLD IN PLACE. WELDER IS TO ENSURE FREE MOVEMENT OF SHAFT
2. ALIGN CONTROL ARM 3/8" PIN HOLE (ITEM 2. WITH VANE

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED					ADVANCED BURNER TECHNOLOGIES
DRAWN BY PARKER	DATE	DRAWN			SPIN-FLOW BURNER AIR REGISTER THROAT ASSEMBLY
					PSR-3195-A7-0

IP7_030933

ADVANCED BURNER TECHNOLOGIES

P.O. Box 410, 271 Route 202/206
Pluckemin, NJ 07978
Phone: 908-470-0470; FAX: 908-470-0479

Opti-Flow™ Low NO_x Burner Operating Instructions

For

Elbow Burner

At

IPSC Unit No. 2

IP7_030934

OPERATING INSTRUCTIONS FOR THE OPTI-FLOW™ LOW NO_X BURNER

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OPERATING INSTRUCTIONS FOR THE OPTI-FLOW™ LOW NO_X BURNER

1.0 INTRODUCTION

A burner mixes pulverized coal and air together to produce a controlled flame. The concept is simple, in practice, it is very difficult to achieve complete combustion (low LOI), meet emission requirements (low CO and NOX), flame stability, as well minimizing side effects such as slagging, fouling and burner eyebrows all at the same time. The ABT Opti-Flow Burner can achieve all of these goals, if the correct design information was provided, and the burner is set up by experienced technicians.

The single most critical item is to have the correct proportions of air and fuel at each burner. Each burner must have the correct ratio of fuel to air. This is achieved by balancing the coal conduits so that each line has the same coal flow and adjusting the secondary air control sleeve dampers to provide sufficient airflow to each register. The other adjustments on the Opti-Flow Burner control flame stability and emissions.

The inlet side (fuel) of the burner consists of a "Flat-back Elbow" with Patented flow distributors to break the coal "rope" up and distribute the coal evenly across the cross section of the inlet to the burner. Internally there is an adjustable sliding tip that varies the outlet area of the coal tip within the patented Opti-Flow coal nozzle.

The secondary air side consists of a sleeve damper, perforated plate, outer air zone spin vanes, inner air zone spinner, inner air sleeve damper, and stabilizer vanes on the coal nozzle.

See ABT drawing 03008-100-A00-D0, for a pictorial representation of the burner and its components.

2.0 PHILOSOPHY AND INITIAL SETTINGS OPTI-FLOW™ LOW NOx BURNER

2.1 General

To effectively compensate for the variations in airflow and differences in coal properties, the OPTI-FLOW™ LOW NOx BURNER was designed to have more adjustments than the original burner. It is important to understand the effects of these adjustments and the theory of the burner before attempting to change any of the settings or to tune the burner.

2.2 Flow Philosophy

A pulverized coal/primary air mixture, supplied from a coal pulverizer, is introduced to the fuel injector. The fuel injector's internal flow distribution devices provide a uniform distribution of pulverized coal exiting the Opti-Flow nozzle. By optimizing the axial position of the inner barrel's tip, the best NO_x level and flame shape can be obtained. The positions of the inner register vanes and outer register swirl are also critical to flame shaping.

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The secondary air enters the fuel injector through the Secondary air damper (SAD) which is equipped with a manual activator to control the total amount of secondary air each fuel injector receives. The secondary air register arrangement enables a division of the secondary air stream into two concentric streams through use of an adjustable inner air flow damper. This in turn provides an inner and outer secondary air annulus within the dual air register.

2.3 Dual Secondary Air Registers

As aforementioned the secondary air dual air register arrangement provides a method to divide the secondary air stream into two concentric streams. By utilizing the inner flow damper, airflow can be proportioned between the inner and outer secondary air annulus. The outer air register and inner fixed vane assembly are adjusted to optimize the flame shape and position. These vanes are designed to impart a rotational motion to the secondary air. The settings are determined during the initial burner optimization and are not modulated thereafter. The inner burner barrel provides a pathway for tertiary air required to keep the barrel free of ash buildup or to supply combustion air for an oil or gas igniter if mounted internally within the inner barrel.

a. **Secondary Air Control Sleeve Damper** The sleeve damper (SAD) is the main airflow control device on the burner assembly. During the initial full load burner optimization, adjustment of the outer sleeve (SAD) damper is made to achieve the best possible O2 distribution across the furnace. Once this is accomplished the open position is not normally changed during burner operation.

A perforated plate, installed around the circumference of the secondary air register inlet area, aids in the burner circumferential air distribution. The result of this air distribution improvement is better airflow control through the air register assembly and into the flame zone. The perforated plate is a nonadjustable item.

b. **Outer Air Register Spin Vanes** The outer register spin vanes direct the secondary air stream to enter the furnace in a more axial direction (and with a lesser degree of swirl) than the secondary air passing through the inner air register. This air stream then combines with the reducing atmosphere flame zone approximately two (2) throat diameters into the furnace to provide the remaining air necessary for combustion within this flame zone. The swirl on the secondary air stream promotes sufficient mixing of the two streams to ensure adequate fuel burnout prior to exiting the flame zone.

The outer register is initially set at a nominal 40% open position however; the normal range is found to be between 25 to 65% open. During initial burner optimization, the outer air register position will be fine tuned to produce minimum NOx and a balanced O2 and CO distribution across the economizer exit flue. Qualified personnel should only perform adjustments to the outer air register vane position.

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c. **Inner Air Sleeve Damper** The inner air register regulates the amount of air imparted to the fuel/air mixture in the near-throat area. Working in conjunction with the primary air velocity to control the point of ignition directly in front of the burner nozzle. The inner air sleeve damper is initially set at a nominal 20% open position however; the normal range is from zero to 40% open. During initial burner optimization the inner air register (damper) position will be fine-tuned to optimize the stability of the flame.

d. **Fixed Vane Swirler** The Fixed Vane Swirler utilizes the air coming through the inner register into the inner zone to control the spinning or turbulence of the inner zone air traveling over and around the stabilizer bars located at the burner tip. Developing the correct amount of turbulence will stabilize the flame, allowing for a strong flame root to develop. This stabilization is necessary to achieve the best possible NOx, CO and UBC reduction.

NOTE

ALL BURNER ADJUSTMENTS ARE, TO VARYING DEGREES, DEPENDENT UPON ONE ANOTHER. FOR EXAMPLE, CHANGING THE POSITION OF AN OUTER AIR REGISTER CAN AFFECT THE CO PROFILE. AS A RESULT, BURNER ADJUSTMENTS SHOULD BE DONE SLOWLY AND ONLY BY QUALIFIED PERSONNEL AWARE OF THE POTENTIAL RESULTS OF SUCH MANIPULATION.

2.4 Outer Burner Barrel

The OBB and the burner's coal nozzle forms the discharge nozzle through which the coal/primary air mixture flows. Attached to the discharge section of the outer sleeve is a segmented nozzle which channels the coal/primary air mixture into concentrated inner and outer streams and develops coaxial flame zones.

Uniform distribution of coal about the periphery of the coal nozzle's annular passageway is attained by use of patented flow distribution devices in the "Flat Back" elbow.

The chief design feature of the Opti-Flow nozzle is to control the mixing between the coal/primary air mixture and the secondary air stream. The combination of the concentrated coal streams and the staged secondary air produces near throat flame stoichiometries in the 60-70% range up to about two throat diameters into the furnace (the total burner, however, is operating at normal boiler excess air). At that point, the swirling secondary stream from the outer portion of the throat annulus, containing the remaining combustion air, combines with the flames and provides sufficient mixing to ensure adequate fuel burnout in the zone.

The result of partitioning the coal stream is that the volatiles in the coal are driven out and burned under a more reducing atmosphere than would occur without the Opti-Flow coal nozzle. The coal volatiles contain a high percentage of the fuel bound nitrogen that, when burned in an oxidizing atmosphere, would be converted to NOx. The Opti-Flow

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coal nozzle, by virtue of its operating in a reducing atmosphere, converts the fuel bound nitrogen in the coal volatiles into N2 thus substantially reducing NOx formation and emissions.

3.0 SYSTEM OPTIMIZATION PROCEDURE

3.1 Purpose / Intent

It is very important to note that the purpose of the optimization procedure is to obtain the best overall furnace fires at approximately 20% excess air and to balance or normalize the economizer exit flue gas O2 and CO distributions, and to minimize the NOx levels leaving the stack. It is not the intent or the purpose of this optimization program to equalize the airflow through each burner. Due to differences in conduit-to-conduit coal distribution and the nature of airflow in the furnace, equalizing the burner-air flows may not produce optimum flame shape and balanced flue gas constituent distribution. For this reason the above testing should only be performed by qualified ABT personnel who are fully familiar with the Opti-Flow burner system components and their effect on furnace fires and flue gas constituents.

It is intended that station personnel will work closely with the ABT Service Engineers during the start-up and burner optimization process. In this way, they will become acquainted with the equipment and the procedures used to adjust and modify the combustion process.

3.2 Instrumentation

In order to perform Opti-Flow Low NOx Burner optimization, the following instrumentation is required:

- SAD Sleeve damper position indication.
- An economizer outlet flue gas sample grid, which measures exit gas O2, CO and NOx on a per point basis.
- Individual OFA port flow measurement. (If an OFA System is provided)

3.3 Preparation for Optimization

a. The steam generator's steam flow should be set as close as possible to 100% MCR prior to beginning optimization.

b. With the furnace excess air at approximately 20%, the O2 is to be balanced across the economizer exit.

a. Ensure that coal and primary airflow to the pulverizer (and primary air temperature leaving the pulverizer) are in accordance with the steam generator operating

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instructions. All pulverizers should be in service at equal throughput. Coal feed and primary air measuring devices should be calibrated prior to testing.

b. Normal sootblowing schedules should be adhered to.

c. Check that economizer outlet flue gas sample grid extends across the width of the flue and measures exit gas NOx, O2 and CO on a per point basis. Ensure that any test equipment has been calibrated prior to and after each test phase.

d. Be prepared to record relevant unit data during optimization testing.

e. Actual optimization (at 100% MCR) will begin with components at predetermined positions similar to the following example:

Burner Secondary Air Sleeve Dampers (SAD)	80% Open
Burner Outer Air Registers Spin Vanes	40% Open (initially)
Burner Inner Air Sleeve Damper (Diverter Cone)	20% Open (initially)

Each burner is comprised of the following adjustable components: One Sleeve Damper (SAD), one Outer Air Register Spin Vane, and one Inner Air Sleeve Damper. These adjustable components are used to control the shape and ignition point of the flame, which in turn controls NOx, O2 distribution and CO emissions.

The setting of all of these adjustable components is established during initial start-up (optimization) when the proper test instrumentation is installed. The final settings are tabulated and provided to the customer for future reference. During normal operation following optimization, no adjustments should be necessary (adjustable components are either set or automated) as long as fans, air heaters, pulverizers, etc. are operating properly. Station instrumentation should be monitored to verify that readings match the tabulation supplied following optimization. Visual observation of the flames should also be made to assure proper combustion is occurring. Should any emission readings deviate from normal, then the settings should be checked and readjusted as necessary to return the adjustments to their original settings. Major adjustments are not necessary unless a significant change in fuel supply characteristics occurs. In that case, re-optimization will be required and new settings will have to be determined.

3.5 Initial Start-up Procedure

Bring ignitors into service and with a setting between 20 and 30% open on the burner's windbox inlet dampers (SAD); light off the burners following the normal start-up procedure. Take ignitors out of service after main flames are stable. Burner windbox inlet dampers should now move to the on position and burner sleeve damper set at 80% open, or any position that will yield a stable flame condition. Check that there is no flame

IP7_030940

impingement on any steam generator components and that the flame generally fits the furnace. Ensure that the flame ignition point is in the burner throat. Flame should be bright with little or no smoke. Refer to the steam generator's operating instructions and bring the steam generator to 100% load, while periodically performing the aforementioned flame inspections. Readjust burner parameters such as secondary air sleeve damper (SAD), inner sleeve damper, and outer register vanes, if necessary to attain stable flames.

Adjust the burner SAD dampers to balance the side-to-side O2 profile across the economizer exit flue and minimize CO concentrations. For example, if the O2 value is low on the sides of the unit, SAD's on the outboard columns of burners will be incrementally opened to force more air to the sides of the unit to raise the O2. SAD's in a specified burner column are generally positioned to the same setting. The primary method of optimizing SAD position is the O2 and CO distribution. The secondary method is to monitor the register's secondary airflow. Several adjustments of the outer sleeve dampers are usually required to optimize the O2 and CO distribution. As the O2 is optimized, the CO should fall within acceptable limits. CO inversely follows O2 adjustments; e.g. as O2 decreases, CO increases. While maintaining a 2.5 to 3.5" H_2O ΔP from the windbox to the furnace, (with 20% excess air) O2 should be approximately 3.28% by volume (in wet flue gas) or 3.57% (in dry flue gas) by volume. If the ΔP cannot be attained, incrementally close all burners SAD's to raise the pressure differential (while maintaining the O2 and CO balance). Record values attained. Once the SAD's have been optimized, retain these new open positions. Minor variations from these positions may be required later based on the results of the remaining burner optimization.

After the optimum SAD positions have been determined and set, the outer air registers will be adjusted to obtain the lowest possible NOx values with acceptable O2, CO and unburned carbon. The unburned carbon is a site-specific value, dependant on the actual coal being fired, coal fineness, as well as the unit's furnace configuration. The inner air sleeve damper will remain at the 20% open position and the adjustable tip will be in 0" neutral position. The first set of data will be gathered with the outer registers set at 40% open. Subsequent adjustments will be to test with all burner outer registers at 30%, 20% and 60% open as a minimum. Outer register positions are intended to be uniform on all burners, however in some instances it may be necessary for some burners to be set slightly different in order to provide good flame shape, desired ignition points or aid in optimizing O2/CO distribution.

Now that the outer registers have been optimized, proceed with inner register adjustments. The same philosophy used to reduce NOx in the previous paragraphs will be applied here; however, the range of open register positions is different. The first test will be run with the inner registers set at 20% open. Subsequent adjustments will be to test all burner inner registers at 30% 15% and 0% open as a minimum. The test grid results will dictate the best position.

IP7_030941

With the SAD and outer/inner registers set at their optimized positions, record emissions at the stack.

NOTE

DURING REGISTER POSITIONING IT IS IMPORTANT TO STROKE ALL REGISTERS TO THEIR NEXT POSITION CONSISTENTLY. WHEN MOVING A REGISTER TO A FURTHER OPEN POSITION, OPEN THE REGISTER 15-20% FURTHER THAN THE DESIRED SETTING, THEN IN A CLOSED DIRECTION UNTIL THE DESIRED POSITION IS ATTAINED. WHEN MOVING A REGISTER TO A FURTHER CLOSED POSITION, JUST CLOSE DOWN THE REGISTER UNTIL THE DESIRED POSITION IS ATTAINED.

3.6 Additional Testing

Following completion of full-load optimization testing on all burners, additional testing should be performed under the following conditions:

- Full load testing should be performed with one row of burners out-of-service. Check the flame shapes and flue gas O2 and CO side-to-side distribution. Should this test produce an unacceptable flame shape or flue gas O2 and CO side-to-side distribution, some of the "optimum" burner settings should be fine-tuned. For units with two firing walls, a double check should be performed by again performing the foregoing test with a row of burners out-of-service on the opposite firing wall.

- Test at control load (at a reduced load where main steam and/or reheat steam temperatures can be maintained at full-load values).

- Test at minimum load (at the lowest reduced load such that any additional load reduction would cause unstable firing).

This additional testing is performed to check that the foregoing established settings produce acceptable results over the total load range. However, minimal adjustments may be required to obtain desired flame shapes, emissions, etc. at these loads.

Following completion of this off-full-load testing series, the unit shall be returned to full load/all burners operation for a final check and fine-tuning. The burner air register, sleeve damper, inner air damper and sliding tip positions found following the fine/tuning are the final optimum positions for the system. All the positions shall be noted for future reference.

At the conclusion of testing, combustion efficiency should be checked. An acceptable unburned carbon value is an inherent result of the forgoing optimization procedure, which provides the proper mix of fuel and air along with optimized O2, CO and NOx and

IP7_030942

therein-acceptable combustion efficiency.

4.0 OPERATION

4.1 General

The following burner operating procedures should be used in conjunction with the steam generator and auxiliary equipment operating procedures.

4.2 Start-up

a. The secondary air flow should be set at not less than the established flow for the boiler purge at all times.

b. The outer Secondary Air Sleeve damper (SAD) preliminary positions are set during initial start-up and optimization for the burners, and are in auto control (if electrically equipped) thereafter. In addition, the outer air register (swirl) and inner air register damper, are also set during optimization and should not require additional adjustment.

c. If the burner had been operating prior to this light off, a fifteen-minute burner tip cool down period shall be completed prior to establishing coal flow to the burner. This cool down is required to avoid coking from starting on the hot tip surface. This is normally accomplished by purge airflow or by warm-up air, during the mill warm-up time, with the coal feeder off.

d. Confirm that the ignitors are operable and ready for operation. If an Ignitor or burner is inoperable, it is recommended that the entire burner group not be started.

e. Select the burners (and pulverizer) to be initially placed into service. Preferably, this should be the lowest row of burners. However, as operating experience and / or operating conditions dictate, other rows can be started first.

f. Light the ignitors for the selected burners and confirm ignition. Refer to the Ignitor manufacture's instructions in your plants operations books. All the burner ignitors associated with one pulverizer should be in service prior to coal being established.

IP7_030943

4.3 Procedures for Firing

a. Observe the fires periodically to be certain that there is no heavy flame impingement on any of the furnace heating surfaces. This may occur due to improper burner adjustments or pulverizer operation.

b. The fuel-air mixture temperature leaving the pulverizer should be maintained at the temperature required by the pulverizer for stable burner operation. This exit temperature is determined by observing flame stability characteristics during actual operation. Initially set the exit temperature at 160^0F. Depending on the fuel being burned, pulverizer exit temperature may vary between 125^0F and 170^0F with acceptable stable flame conditions at the burners.

c. It is desirable to keep as many burners and pulverizers in service as the boiler load will permit. However, when the load is to be decreased below the stable minimum output for burners, burners by groups associated with pulverizers should be taken out of service. At low capacity operation, it is important that burner operation be watched closely to insure stable combustion conditions are maintained during this period.

d. Place the igniters into service for those burners that are to be taken out of service. If there is evidence of instability due to some abnormal condition of operation or fuel quality, and it remains possible that the root cause is furnace-wide, it may be desirable to use the igniters for all burners installed in the furnace. SAFETY—FIRST

CAUTION

IF OPERATION WITH PULVERIZED FUEL APPEARS UNSTABLE, THE USE OF IGNITERS FOR FLAME STABILITY MAY BE REQUIRED AT THE DISCRETION OF THE OPERATOR. ALWAYS MAINTAIN A SAFE, STABLE FLAME. PAY CLOSE ATTENTION TO THE MAIN FLAME SCANNER SIGNAL STRENGTH.

4.4 Fuel Leaks

Fuel leaks to the burner deck or windbox shall be corrected immediately following discovery. Check mating flanges and connecting points in all fuel lines regularly. To avoid fire hazards, the total burner area should be maintained in an extremely clean condition. Any fuel that may have leaked should be cleaned-up immediately.

CAUTION

IP7_030944

AFTER A PULVERIZER IS SHUT DOWN, THE PULVERIZER COAL CONDUITS AND BURNERS MUST BE PURGED OF ALL COMBUSTIBLES

5.0 MAINTENANCE AND LUBRICATION REQUIREMENTS

5.1 General

This section contains special maintenance and lubrication requirements for Opti-Flow burner components. The requirements are defined under each component's title below. In general, a maintenance and repair log should be kept for all maintenance and repair operations performed. Close review of this log will help isolate problem areas and reduce trouble-shooting time. Review applicable vendor literature for maintenance of components such as ignitors/scanners.

5.2 Burner Inner damper and Outer Register Manual Drives

The assemblies require minimal maintenance. The shaft seals are comprised of a 3/8" x 3/8" Square Graphite fiber rope packing.

5.3 Burner Sleeve Damper (SAD)

The only moving parts of damper assembly that may need to be lubricated during each maintenance outage are the shafts and support rollers. Molykote 321-R (Dow Corning Corp., Midland, Mich. 48640) or equivalent should be used if binding occurs. It is preferable not to lubricate these components.

6.0 SPECIAL TOOLS

6.1 General

There are no special tools required to assemble, disassemble, or maintain the Opti-Flow burners; a set of common mechanic's tools will suffice.

7.0 ASSEMBLY AND DISASSEMBLY

7.1 General

Assembly and disassembly of the Opti-Flow burner shall be accomplished in accordance with the drawings. Erection and general notes on the drawings, as well as the dimensional layout, define the method of assembly (and therefore disassembly).

IP7_030945

INTERMOUNTAIN POWER SERVICE CORPORATION

☒ REQUISITION FOR CAPITAL EQUIPMENT

☐ PURCHASE AUTHORIZATION FOR EXPENSE ITEMS

Date:
Req./PA No: 190833
P.O. No:
Vendor:
Terms:
FOB:
Ship Via:
Conf. To:

Purpose of Materials, Supplies or Services:

New low NOx burners for Unit 2.

Suggested Vendor: To be determined

Account No. 002-SGX-402

Work Order No. 03-96033-0

Project No. IGS03-04

Qty	Unit	Description Noun Adjective	Catalog #	Seller or Manufacturer	Unit Cost	Extension
48	ea	Burners, Low NOx				
		These burners are to be installed in Unit 2				
		during the upcoming Spring 2004 outage.				
		All burners are to be replaced in Unit 2 with				
		the new Low Nox burners				
		This requisition is to cover all purchase and				
		installation costs of the new burners.				
		TOTAL ESTIMATED COST				$4,500,000.00

Remarks:

Delivery requested by [Date] 02-13-04 Originator Phil Hailes

Dept. Mgr/Supt. Date Station Manager Date Operating Agent Date

IP7_030946

INTERMOUNTAIN POWER SERVICE CORPORATION

☒ REQUISITION FOR CAPITAL EQUIPMENT

☐ PURCHASE AUTHORIZATION FOR EXPENSE ITEMS

Date:
Req./PA No: 194467
P.O. No:
Vendor:
Terms:
FOB:
Ship Via:
Conf. To:

Purpose of Materials, Supplies or Services:

Addendum to Contract #04-45606, Low NOx Burner Purchased from Advanced Burner Technologies

Suggested Vendor: Advanced Burner Technologies

Account No. 002-SGX-402

Work Order No. 03-96033

Project No. IGS03-04

Qty	Unit	Description Noun Adjective Catalog # Seller or Manufacturer	Unit Cost	Extension
48	ea	253 MA, material upgrade for burner components.	$850.00	$40,800.00
48	ea	Coal flow divider, x-vane spool piece.	$850.00	$40,800.00
	ea	Air flow measurement components from Air Monitor,		$35,220.00
		with selected upgrades. See the attached Addendum		
		to IPSC Contract 04-45606.		
		TOTAL ESTIMATED COST		$116,820.00

Remarks: This purchase requisition is intended to be an addendum to the existing contract. The above items are considered to be improvements worth purchasing at the additional cost.

Delivery requested by [Date] 11-07-03 Originator Phil Hailes

Dept. Mgr/Supt. Date Station Manager Date Operating Agent Date

IP7_030947

INTERMOUNTAIN POWER SERVICE CORPORATION

☒ REQUISITION FOR CAPITAL EQUIPMENT

☐ PURCHASE AUTHORIZATION FOR EXPENSE ITEMS

Purpose of Materials, Supplies or Services:

Installation of Low NOx Burners in Unit 2

Date:
Req./PA No: 194493
P.O. No:
Vendor:
Terms:
FOB:
Ship Via:
Conf. To:

Suggested Vendor: TEI Construction Services
7870 Schillinger Park West
Mobile, AL 36608

Account No. 00-2SGX-402
Work Order No. 03-96033-0
Project No. IGS03-04

Qty	Unit	Description Noun Adjective Catalog # Seller or Manufacturer	Unit Cost	Extension
1	ea	Installation of 48 Low NOx Burners in Unit 2.	$1,616,800.00	$1,616,800.00
		TEI Construction Services is to install the ABT		
		supplied burners during the upcoming Unit		
		Spring, 2004 outage IN ACCORDANCE WITH		
		THE ATTACHED SPECIFICATION.		
		TOTAL ESTIMATED COST		$1,616,800.00

Remarks:

Delivery requested by [Date] 01/15/04 Originator Phil Hailes

Dept. Mgr/Supt. Date Station Manager Date Operating Agent Date

IP7_030948

Inspection Check List – Complete Burner Module

Customer/Plant:	Contract Number:	Burner No:
Intermountain Power Service	IPSC: 04-45606, ABT:A03008	

Operational Testing Note: - use operator if shop installed - insure correct indicator/pin position	**Accept** ✓	**Init**	**Comment**
Sleeve damper full stroke operation			
Outer Spin Vanes full stroke operation			
Inner air zone damper full stroke operation			

Dimensional Checks	**Drawing Value**	**Actual Value**	**Init**
Distance from I.S. face of WB closure plate to burner throat			
OD of burner throat- check at 4 locations (record max.)			
Verify clearance/play for moving part (1/8" min. over full range) @ assembly of sub-assemblies			
Distance from O/S fuel inject mounting plate to O/S fuel injector flange			
Distance from face of burner throat to face of flow divider			
Distance from face of flow divider to face of OBB cast tip			
Concentricity, OBB tip to flow divider (record max/min)			
Concentricity, flow divider to burner throat (rec. max/min)	Min: Max:		

Miscellaneous Verifications	✓
Verify ignitor clearance for (test pipe of same OD as igniter support pipe)	
Verify line of sight with registers open and closed for a main flame scanner	
b igniter scanner	
c sight glass	
Verify that packing was installed in packing glands	
Verify that packing glands are loose (bolts finger tight & taped)	
Verify burner number- rotation and fuel injector number agree with GA	
Mark WB closure plate with arrow, CW/CCW, and assembly number	
Verify spring pins are installed on all manual control rods	
Verify all temporary shipping supports are welded and marked with yellow paint	
Strip all masking	
Verify load includes correct number of loose parts, identified on GA, for each burner	
Secure packing list to one burner of each load	

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: George W. Cross

FROM: Dennis K. Killian

DATE: November 6, 2003

SUBJECT: Unit 2 Burner Contract Adders

We recommend a material upgrade, a modified flow diffuser design and an additional amount for upgrading the burner air flow instrumentation system within the Unit 2 Burner Replacement capital project. There is $4,500,000 budgeted for this year for burner replacement and $420,000 for scanner replacement. Both of these projects are being handled under the ABT Contract. The original ABT material contract was for $2,449,660 and these adders will bring it to a total of $2,566,480. The installation contract is yet to be awarded. The burner replacement project was justified with an 18 percent rate of return and a 0.9 year payback.

The successful bidder for the Unit 2 Burners (ABT) provided, within their bid offering, several alternate design options on which we have now concluded our evaluations. The adders shown on the attached requisition are as follows:

- Upgraded burner materials
- Independent coal flow diffuser
- Upgraded air flow instrumentation

Upgraded Burner Materials

ABT has proven to have an excellent record in eliminating burner deformation at all installations to-date. However, the IGS burners are slightly larger and will be exposed to somewhat higher heat flux than ABT has seen. The 253 MA material is our current choice in the most severe applications at the burner front. It has provided the best service of any alloy, including stainless. The approximate $41K for upgrading to this material is a relatively small price to pay for a significant degree of component life assurance.

Independent Coal Flow Diffuser

The original design of the ABT burners included an in-built flow diffuser in the burner elbow. This assembly required all burner elbows to be shipped off-site for modification. In addition to concerns for the outage schedule, this would also have made the diffuser replacement procedure both complicated and expensive.

As we noted this to ABT they provided an alternative method of installing this required flow straightener in a removable design, totally separate from the burner elbow. This will eliminate concerns over trucking burner elbows across the country and will make maintenance of this wear item much more cost effective.

Upgraded Air Flow Instrumentation
After considerable evaluation, ABT chose to offer air flow instrumentation from Eastern Instruments Inc.(EI) that while technically sound, had relatively little experience in secondary air systems and absolutely no experience in burner applications.

We followed up with our own evaluation of both EI and the more established vendor Air Monitor, Inc. Air Monitor has notable experience in burner air systems. Also, we have purchased a significant number of the Air Monitor systems which are currently installed in the primary air flow at each pulverizer and throughout the new overfire air systems. We are recommending that the Air Monitor system be purchased with an increase in price of $35,220.

Please note your approval to these contract changes by signing the attached requisition. If you have any further questions, please contact Jerry Hintze at ext. 6460.

JHN/JKH:jmg
Attachments

INTERMOUNTAIN POWER SERVICE CORPORATION

☒ REQUISITION FOR CAPITAL EQUIPMENT

☐ PURCHASE AUTHORIZATION FOR EXPENSE ITEMS

Date:
Req./PA No: 194467
P.O. No:
Vendor:
Terms:
FOB:
Ship Via:
Conf. To:

Purpose of Materials, Supplies or Services:

Addendum to Contract #04-45606, Low NOx Burner Purchased from Advanced Burner Technologies

Suggested Vendor: Advanced Burner Technologies

Account No. 002-SGX-402

Work Order No. 03-96033

Project No. IGS03-04

Qty	Unit	Description Noun Adjective	Catalog #	Seller or Manufacturer	Unit Cost	Extension
48	ea	253 MA, material upgrade for burner components.			$850.00	$40,800.00
48	ea	Coal flow divider, x-vane spool piece.			$850.00	$40,800.00
	ea	Air flow measurement components from Air Monitor,				$35,220.00
		with selected upgrades. See the attached Addendum				
		to IPSC Contract 04-45606.				
		TOTAL ESTIMATED COST				$116,820.00

Remarks: This purchase requisition is intended to be an addendum to the existing contract. The above items are considered to be improvements worth purchasing at the additional cost.

Delivery requested by [Date] 11-07-03 Originator Phil Hailes JHH

JBK 11-6-03 11/6/03

Dept. Mgr/Supt. Date Station Manager Date Operating Agent Date

IP7_030952

Addendum to IPSC Contract 04-45606, Unit 2 Low NOx Burners

23 Oct 2003

Based on cost and experience we recommend Air Monitor as the vendor for burner air flow measurement in the U2 Low NOx burners.

The following terms are to be incorporated as the base for purchasing and installing Air Monitor's IBAM probes on 48 Low Nox burners on U2 in March 2004. This addresses our concerns with installation, accuracy, plugging, and equipment failure:

Installation:
1) Air Monitor will work with Advanced Burner Tech to provide installation drawings and material for the tubing lines from the burner through the wind box wall: ie, tubing temperature expansion bends, hangers/supports and flex connections to allow wind box expansion.
2) The installation will be 48 Velotron II transmitters with Auto-purge II/sp, with no pressure or temperature density correction, but will have a 4-20 mA output to the DCS and autopurge included.
3) Stainless steel tubing is provided to tie (header) the IBAM's together and then forward the dP signal from the IBAM pitot header to the bulkhead. The transmitter cabinets, one on each burner level, and will be installed with factory installed Velotron II differential pressure transmitters and auto purge valves. Transmitters will be installed in NEMA 4 cabinets on each burner level. Minium of 8 cabinets, it would be ok to use 16 cabinets to allow shorter tubing runs. Tubing will be supplied from the transmitter cabinet to the pitots with necessary fittings, expansion joints and flex connections.
4) Delivery of transmitter/purge panels shall be onsite by 18 Feb 2004. Delivery of probes to preinstall on burners shall be coordinated with ABT prior to shipment of the burners.
5) Includes 4 on-site man-days for Air Monitor factory technician startup and training support.

Accuracy:
Accuracy of better than 3% will be assured by:
1) Installing 3 IBAM stainless steel pitot probes (144 total) in each burner on the burner backplate or at optimal locations determined by CFD and experimental wind tunnel testing. During the testing configurations of 2, 3 and 4 probes will be compared for accuracy.
2) Air Monitor performing or subcontracting to Air Flow Sciences or Advanced Combustion CFD modeling of the burner flow to determine the predicted best probe location and to assist ABT in designing the optimum holes in the perforated plate. This work not to exceed $10K. Coordinate with ABT on selecting preferred CFD vendor.
3) Setting up full scale wind tunnel testing with a full scale mockup (the actual burner may be used if available) to verify that there is agreement better than 3% between the air flow in a certified flow nozzle and the pitots in the burner. This will be done at flow velocities similar to those in the burner installation. A chamber simulating IPSC's wind box will be constructed of at least 10 ft x 10 ft x 10 ft with air flowing in from varying directions to simulate real world conditions. Verify 3% accuracy maintained over 3:1 velocity turndown. A test matrix of sleeve damper position, swirler angle, # of probes, probe location will be run for various flowrates.

Customer observations of the air flow testing will be encouraged and supported.
4) Wind tunnel testing shall commence prior to Feb 2004.

Pluggage:
1) Supplied autopurge system will be programmed for a 1 minute high pressure autopurge once per day to remove fly ash particles from the IBAM probes. Within each enclosure the purges will be sequential.
2) Low turbulence and vortexes are expected due to the perforated plate, which will be designed according to CFD models to minimize turbulence and vortexes inside the burners.

Equipment Failure:
1) Should the IBAM pitots or auto purge system become damaged due to elevated temperatures, vibration, pluggage or other unforseen failure mode, Air Monitor will provide a 2 year replacement warranty of all equipment; as long as the burner structure at the IBAM Pitot insertion location has not been damaged also as a result of elevated temperatures.
2) Air Monitor will fabricate replacement pitots once the failure has been identified so they can be on site prior to a planned or forced outage for retro-fit. The new replacement probes will be provided within a timely period within 3 months maximum to meet IPSC's outage windows.
3) The replacement IBAM pitots will carry a renewed 2 year guarantee from the time of installation.

Upon successful installation and performance, IPSC agrees that Air Monitor can use IPSC as a reference and publish the results in a white paper.

From: James Nelson
To: Howard Hamilton; Phil Hailes
Date: 3/10/2004 4:16:43 PM
Subject: Fwd: Payment Release

>>> James Nelson 3/10/2004 4:09:44 PM >>>
Joel:
Per the contract I've got to retain 10% of the contract price until after startup. I'm not counting the adders in the 90% calc, however, the allowable payment to get us to 90% of the contract amount by my numbers is $672,359.50. Not the 741,365 you are showing on this invoice. Also I'm not going to pay for the diffusers until I have them all, but if you want to show the 40,800 for the burner material upgrade and the 35,220 for the burner pitot upgrade I'll release both of those immediately.

If you agree with the numbers above please fax me a corrected invoice to 435-864-0764. thx

>>> "joel" <joel@advancedburner.com> 3/10/2004 12:42:13 PM >>>
James:
The payments we have rec'd are:
11/21/03.....20% mat'l on order.....$494,244.
12/9/02.....10% Gen'l arrangem'ts..... 247,122.
2/18/04.....30% Commence Fab..... 741,365
Total paid to
date.....1,482,731

contract price: $ 2,449,660

Current Inv:.....858,185
This brings the total invoiced amount to $2,240,916
(Not including the extra for insurance)

Therefore, if you are holding the 40,800 for the diffusers, the amount we ask that you send immediately is $817,385.

There has been no incorrect or double billing.
Please confirm that we are in agreement on this.

Thanks,
Joel

----- Original Message -----
From: "joel" <joel@advancedburner.com>
To: "James Nelson" <JIM-N@ipsc.com>
Cc: "Sal Ferrara" <sal@advancedburner.com>
Sent: Wednesday, March 10, 2004 10:53 AM
Subject: Re: Re:

> The invoice ou are holding is for the 30% on shipment, issued 2/18/04, plus
> the additional items.
>
> The earlier payment for 741,365(also 30%) was correct and received on

2/18.
>
> The invoice you have is correct and the amount you owe is the $741,365 for
> final shipment.
>
> Would appreciate if you could overnight that check.
>
> Thanks,
> Joel
>
>
> ----- Original Message -----
> From: "James Nelson" <JIM-N@ipsc.com>
> To: <joel@advancedburner.com>
> Sent: Wednesday, March 10, 2004 11:33 AM
> Subject: Re:
>
>
> > As I looked into this it turns out that the major portion of invoice
> > A03008-5 ($741,365) has already been paid to you on 2/13/04. I have
> > released two of the remaining three items ($76,020). The last item,
> > (40,800) is additional charge for the diffusers; When we get the last of
> > the diffusers on Monday I will release that for payment also. jhn
> >
> > >>> "joel" <joel@advancedburner.com> 3/9/2004 11:03:18 AM >>>
> > James:
> >
> > Considering how we are progressing with shipping the remaining
> > equipment Iam asking you to release the check you are holding.
> >
> > Whether you pay us now or not, we would still do everything possible to
> > ship ASAP; as we are doing.
> >
> > Withholding that payment achieves only one effect: it creates a major
> > cash-flow problem for us.
> >
> > So I would apreciate it if you would have it overnighted to us.
> >
> > Joel
> >
>

INTERMOUNTAIN POWER SERVICE CORPORATION

September 5, 2003

Mr. Eric J. Tharp
Operating Agent for the Intermountain Power Project
Los Angeles Department of Water and Power
111 North Hope Street, Room 1263
Los Angeles, CA 90012-2694

Bid Award Approval - Specifications 45606 and Contract 04-45606
Unit 2 Low NOx Burners

Dear Mr. Tharp:

Attached for your review and approval is the IPSC Bid Evaluation Transmittal and other documents for Unit 2 Low NOx Burners.

Please fax your approval to Nancy Bennett at (435) 864-6678 as soon as possible.

If you have any questions, please contact Phil Hailes, ext. 6438, or Nancy Bennett, ext. 6538.

Sincerely,

George W. Cross
President and Chief Operations Officer

NB:lf
Attachments

c: George Cross w/o Attachments
Dennis Killian w/o Attachments
James Nelson w/o Attachments
Phil Hailes w/o Attachments
Nancy Bennett
Contract File

850 West Brush Wellman Road, Delta, Utah 84624 / Telephone: (435) 864-4414 / FAX: (435) 864-6670 / Fed. I.D. #87-0398573

INTERMOUNTAIN POWER SERVICE CORPORATION

PRICE & TIME CONTRACT BID EVALUATION SHEET

SPEC NO. 45606 TITLE Low Nox Burner DATE Aug 25, 2003

Bidder	Total Contract Cost w/o Option
GE Energy & Environmental Research Corp.	$1,978,367 (See Bid for Options)
Advanced Burner Technologies	$2,449,660 (See Bid for Options)
Babcock and Wilcox	$2,876,565 (See Bid for Options)
Riley Power Inc.	$4,125,300 (See Bid for Options)

*All bidders are taking exceptions for our Contract Terms and Conditions.
**Also note: Some bidders are offering Letters of Credit in lieu of a Performance Bond and one bidder is including the cost of the Performance Bond in the Bid Cost as an option.

Recommendation: Award to Advanced Burner Technologies bidder offering service and/or materials in compliance with the specifications at lowest ultimate cost.

IPSC ENGINEERING APPROVAL [signature] FOR DKL DATE 9-5-03

IPSC MANAGEMENT APPROVAL [signature] DATE 9/5/03

OPERATING AGENT'S AUTHORIZATION _____ DATE _____

IP7_030958

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: George W. Cross

FROM: Dennis K. Killian

DATE: September 2, 2003

SUBJECT: New Burner Bid Evaluation and Recommendation

It is recommended that new low NOx burners for installation during the upcoming Unit 2 outage, be purchased from Advanced Burner Technologies (ABT). This recommendation is based upon review of bid packages received from four burner manufacturers.

A summary of the ABT bid package follows:

1) Second lowest base bid offered. The base bid, including scanners, is $2,449,660.
2) Best NOx (.33 lb/MBTU)and CO (<200 ppm) guarantees, with no over-fire air staging, of all bids.
3) Good recommendations from and experience at other similar power plants.
4) Base package also includes modeling, secondary air duct air flow balancing and air pressure transmitters.

Contact Phil Hailes at Extension 6438 with comments or questions.

INTERMOUNTAIN POWER SERVICE CORPORATION

● REQUISITION FOR CAPITAL EQUIPMENT

☐ PURCHASE AUTHORIZATION FOR EXPENSE ITEMS

Purpose of Materials, Supplies or Services:

New low NOx burners for Unit 2.

Attn Nancy Bennett

Date:	
Req./PA No:	190833
P.O. No:	
Vendor:	
Terms:	
FOB:	
Ship Via:	
Conf. To:	

Suggested Vendor: To be determined

Account No. 002-SGX-402
Work Order No. 03-96033-0
Project No. IGS03-04

Qty	Unit	Noun Description Adjective Catalog # Seller or Manufacturer	Unit Cost	Extension
48	ea	Burners, Low NOx		
		These burners are to be installed in Unit 2		
		during the upcoming Spring 2004 outage.		
		All burners are to be replaced in Unit 2 with		
		the new Low Nox burners		
		This requisition is to cover all purchase and		
		installation costs of the new burners.		
				$4,480,000.00
		TOTAL ESTIMATED COST		~~$4,500,000.00~~

RECEIVED
JUL 30 2003
PURCHASING

Remarks:

Delivery requested by (Date) 02-13-04 Originator Phil Hailes

[signature] for DKH — Dept. Mgr/Supt. Date
[signature] — Station Manager
7/09/03 — Date
Bruce Harvey — Operating Agent
8-7-03 — Date

IP7_030960

ADVANCED BURNER
PO# 04-45606

VENDOR# 8075
COST CODE: 2SGX-402

CONTRACT ADMIN.: Phil Hailes
BUYER: Nancy Bennett
Service Contract
Dated 09-17-03 to 04-20-04
Release # 04-45606-XXX

NOT TO EXCEED: $2,648,038.00

DATE PAID	INVOICE NUMBER	RELEASE NUMBER	PAYMENT TOTAL	ACCRUED TAX	TOTAL PAID	BALANCE
					$0.00	$2,648,038.00
11-06-03	A03008-2	002	$494,244.00	$28,419.03	$494,244.00	$2,153,794.00
11-13-03	A03008-1	002	$30,000.00	$1,725.00	$524,244.00	$2,123,794.00
12-15-03	A03008-3	003	$247,122.00	$14,209.52	$771,366.00	$1,876,672.00
02-13-04	A03008-4	004	$741,365.00	$42,628.49	$1,512,731.00	$1,135,307.00
			1,512,731	86,982.04		
			86,982.04			
			1,599,713.04			

ADVANCED BURNER TECHNOLOGIES

350 Main Street, Suite 5
Bedminster, NJ 07921
P 908.470.0470
F 908.470.0479
www.advancedburner.com

ORIGINAL

Invoice

DATE	INVOICE #
9/25/2003	A03008-1

BILL TO	SHIP TO
Intermountain Power Service Corporation Attn: Accounts Payable Department 850 West Brush Wellman Road Delta, UT 84624-9546	Intermountain Power Service Corporation Attn: James Nelson 850 West Brush Wellman Road Delta, UT 84624-9546

04-45606-002

P.O. NUMBER	TERMS	REP	SHIP	VIA	F.O.B.	PROJECT
04-45606-002	Net 30 Days		2/13/2004	Best Way	Delta, UT	A03008

QUANTITY	ITEM CODE	DESCRIPTION	PRICE EACH	AMOUNT
1	1	50% of Professional Liability Premium	30,000.00	30,000.00

ACCRUED TAX $ 1,725.00

PAYMENT AUTHORIZATION #
WORK RELEASE # 04-45606-1
SERVICE CONTRACT # 04-45606
WORK ORDER # 03-96033-0
INVOICE # A03008-1
AMOUNT $ 30,000.00
DATE TO SUBMIT BY 10/3/03

VENDOR # 8075 REMIT TO # PO
04050132664
AMT PAID 30,000.00
CHECK # 144364 11/13/03
PB

RECEIVED
SEP 29 2003
IPSC ACCOUNTING

	Total SB	$30,000.00

IP7_030962

ADVANCED BURNER TECHNOLOGIES

271 Route 202/206
P.O. Box 410
Pluckemin, NJ 07978
P 908.470.0470
F 908.470.0479
www.advancedburner.com

ORIGINAL

Invoice

DATE	INVOICE #
10/24/2003	A03008-2

BILL TO	SHIP TO
Intermountain Power Service Corporation Attn: Accounts Payable Department 850 West Brush Wellman Road Delta, UT 84624-9546	Intermountain Power Service Corporation Attn: James Nelson 850 West Brush Wellman Road Delta, UT 84624-9546

P.O. NUMBER	TERMS	REP	SHIP	VIA	F.O.B.	PROJECT
04-45606-002	Net 15 Days	00	2/13/2004	Best Way	Delta, UT	A03008

QUANTITY	ITEM CODE	DESCRIPTION	PRICE EACH	AMOUNT
1	1	20% Material on order	494,244.00	1) 494,244.00
		PAYMENT AUTHORIZATION # 196953 WORK RELEASE # 04-45606-01 SERVICE CONTRACT # 04-45606 WORK ORDER # 03-96033-0 INVOICE # A03008-2 AMOUNT $ 494,244.00 DATE TO SUBMIT BY 10/31/03		
		ACCRUED TAX $ 28,419.03		
		RECEIVED OCT 27 2003 IPSC Accounting		
		VENDOR # 8075 REMIT TO # 2 VOUCHER # 0405013310 AMT PAID $ 494,244.00 CHECK NO 04-0844 DUE DATE 1/03		
			Total	$494,244.00

IP7_030963

ADVANCED BURNER TECHNOLOGIES

271 Route 202/206
P.O. Box 410
Pluckemin, NJ 07978
P 908.470.0470
F 908.470.0479
www.advancedburner.com

ORIGINAL

Invoice

DATE	INVOICE #
11/11/2003	A03008-3

BILL TO	SHIP TO
Intermountain Power Service Corporation Attn: Accounts Payable Department 850 West Brush Wellman Road Delta, UT 84624-9546	Intermountain Power Service Corporation Attn: James Nelson 850 West Brush Wellman Road Delta, UT 84624-9546

04-45606-003

P.O. NUMBER	TERMS	REP	SHIP	VIA	F.O.B.	PROJECT
04-45606	Upon Receipt		2/13/2004	Best Way	Delta, UT	A03008

QUANTITY	ITEM CODE	DESCRIPTION	PRICE EACH	AMOUNT
1	1	Submittal of Burner General Arrangements	247,122.00	247,122.00

PAYMENT AUTHORIZATION # 197656
WORK RELEASE # 04-45606-001
SERVICE CONTRACT # 04-45606
WORK ORDER # 03-96033-0
INVOICE # A03008-3
AMOUNT $ 247,122.00
DATE TO SUBMIT BY 11 / 24 / 03

ACCRUED TAX $ 14,209.52

RECEIVED
NOV 17 2003
IPSC Accounting

VENDOR # 8075 REMIT TO # 2
VOUCHER # 0406015802
AMT PAID $ 247,122.00
PR ~~CHECK NO~~ # 04-0914 DUE DATE 12-5-03

Please Fed Ex to
Account #
2108-23891

Total SB $247,122.00

IP7_030964

COPY

ADVANCED BURNER TECHNOLOGIES

271 Route 202/206
P.O. Box 410
Pluckemin, NJ 07978
P 908.470.0470
F 908.470.0479
www.advancedburner.com

ORIGINAL

PAY REQ

COPY

Invoice

DATE	INVOICE #
11/11/2003	A03008-3

BILL TO	SHIP TO
Intermountain Power Service Corporation Attn: Accounts Payable Department 850 West Brush Wellman Road Delta, UT 84624-9546	Intermountain Power Service Corporation Attn: James Nelson 850 West Brush Wellman Road Delta, UT 84624-9546

P.O. NUMBER	TERMS	REP	SHIP	VIA	F.O.B.	PROJECT
04-45606	Upon Receipt		2/13/2004	Best Way	Delta, UT	A03008

QUANTITY	ITEM CODE	DESCRIPTION	PRICE EACH	AMOUNT
1	1	Submittal of Burner General Arrangements	247,122.00	247,122.00

11-20-03
Phil,
Please process if OK to Pay.
Thanks!
Sheila

PAYMENT AUTHORIZATION # 197656
WORK RELEASE # 04-45606-001
SERVICE CONTRACT # 04-45606
WORK ORDER # 03-96033-0
INVOICE # A03008-3
AMOUNT $ 247,122.00
DATE TO SUBMIT BY 11 / 24 / 03

Arrangement Drawings Received.
OK to pay.
[signature] 11/24/03

RECEIVED
NOV 17 2003
IPSC Accounting

VENDOR # 8025 REMIT TO #
VOUCHER #
AMT PAID $ 247,122.00
CHECK NO DUE DATE 11 / 03

Total SB $247,122.00

[signature] 12-1-03

IP7_030965

ADVANCED BURNER TECHNOLOGIES

271 Route 202/206
P.O. Box 410
Pluckemin, NJ 07978
P 908.470.0470
F 908 470.0479
www.advancedburner.com

ORIGINAL

Invoice

DATE	INVOICE #
1/20/2004	A03008-4

BILL TO	SHIP TO
Intermountain Power Service Corporation Attn: Accounts Payable Department 850 West Brush Wellman Road Delta, UT 84624-9546	Intermountain Power Service Corporation Attn: James Nelson 850 West Brush Wellman Road Delta, UT 84624-9546

P.O. NUMBER	TERMS	REP	SHIP	VIA	F.O.B.	PROJECT
04-45606-004	Upon Receipt		2/13/2004	Best Way	Delta, UT	A03008

QUANTITY	ITEM CODE	DESCRIPTION	PRICE EACH	AMOUNT
1	1	30% Commence fabrication	741,365.00	741,365.00

ACCRUED TAX $ 42,628.49

PAYMENT AUTHORIZATION #
WORK RELEASE #
SERVICE CONTRACT # 04-45606
WORK ORDER # 03-96033-0
INVOICE # A03008-4
AMOUNT $ 741,365.00
DATE TO SUBMIT BY 1/26/04

VENDOR # 8075 REMIT TO # 2
VOUCHER # 0408020706
AMT PAID $ 741,365.00
CHECK NO 04-151H DUE DATE 2/13/04

Rec'd 1-24-04

Total	$741,365.00

IP7_030966

COPY

ADVANCED BURNER TECHNOLOGIES

50 Main Street, Suite 5
Bedminster, NJ 07921
P 908.470.0470
F 908.470.0479
www.advancedburner.com

ORIGINAL

Invoice

COPY

DATE	INVOICE #
9/25/2003	A03008-1

BILL TO	SHIP TO
Intermountain Power Service Corporation Attn: Accounts Payable Department 850 West Brush Wellman Road Delta, UT 84624-9546	Intermountain Power Service Corporation Attn: James Nelson 850 West Brush Wellman Road Delta, UT 84624-9546

P.O. NUMBER	TERMS	REP	SHIP	VIA	F.O.B.	PROJECT
04-45606	Net 30 Days		2/13/2004	Best Way	Delta, UT	A03008

QUANTITY	ITEM CODE	DESCRIPTION	PRICE EACH	AMOUNT
1	1	50% of Professional Liability Premium	30,000.00	30,000.00

PAYMENT AUTHORIZATION #
WORK RELEASE # 04-45606-1
SERVICE CONTRACT # 04-45606
WORK ORDER # 03-96033-0
INVOICE # A03008-1
AMOUNT $ 30,000.00
DATE TO SUBMIT BY 10 / 3 / 03

10-2-03
James,
Please process if ok to Pay
Thanks
Sheila

VENDOR # 8075 PERMIT TO #

30,000 00

CHECK # 10/9/03

RECEIVED
SEP 29 2003
CC ACCOUNTING

	Total	SB	$30,000.00

IP7_030967

Jacobson, Goldfarb & Scott Inc
960 Holmdel Rd, Building II
Holmdel, NJ 07733-0409
Phone : 732-834-9800 Fax : 732-834-0233

INVOICE# 15837	Page 1
ACCOUNT NO. ADVAN-3 OF LS	DATE 10/20/03
PRODUCER Nicholas S. Ferrara	
BALANCE DUE ON 10/20/03	
AMOUNT PAID	AMOUNT DUE $ 30,000.00

Advanced Burner Technologies
P.O.Box 410
271 Route 202/206
Pluckemin, NJ 07978

Item #	Trn Date	Trn Type	Policy #	Description	Company		Amount
INVOICE # 15837							
93279	10/20/03	MEM GL-S	A03AG16794	Inter-Mountain Power Project	Admiral Insurance Company	$	30,000 00

Increased Liability Limits Requirement

Admiral Insurance Company

Policy #A03AG16794

Invoice Balance: $ 30,000.00

ADVANCED BURNER TECHNOLOGIES

271 Route 202/206
P.O. Box 410
Pluckemin, NJ 07978
P 908.470.0470
F 908.470.0479
www.advancedburner.com

COPY ORIGINAL

Invoice

DATE	INVOICE #
10/24/2003	A03008-2

BILL TO	SHIP TO
Intermountain Power Service Corporation Attn: Accounts Payable Department 850 West Brush Wellman Road Delta, UT 84624-9546	Intermountain Power Service Corporation Attn: James Nelson 850 West Brush Wellman Road Delta, UT 84624-9546

COPY

P.O. NUMBER	TERMS	REP	SHIP	VIA	F.O.B.	PROJECT
04-45606	Net 15 Days	00	2/13/2004	Best Way	Delta, UT	A03008

QUANTITY	ITEM CODE	DESCRIPTION	PRICE EACH	AMOUNT
1	1	20% Material on order	494,244.00	494,244.00

PAYMENT AUTHORIZATION #
WORK RELEASE # 04-45606-01
SERVICE CONTRACT # 04-45606
WORK ORDER # 03-960333-0
INVOICE # A03008-2
AMOUNT $ 494,244.00
DATE TO SUBMIT BY 10 / 31 / 03

RECEIVED
OCT 27 2003

VENDOR # 8075 REMIT TO #
VOUCHER #
AMT PAID $ 494,244.00
CHECK NO DUE DATE 1/03

Total SB $494,244.00

IP7_030969

ADVANCED BURNER TECHNOLOGIES

8.1

271 Route 202/206
P.O. Box 410
Pluckemin, NJ 07978
P 908.470.0470
F 908.470.0479
www.advancedburner.com

PURCHASE ORDER

The following numbers must appear on all related correspondence, shipping papers and invoices: **P.O. NUMBER: A03-008-411**

To: Alcon Industries, Inc. 7990 Baker Avenue Cleveland, Ohio 44102	Ship To: Passaic County Welders, Inc. 100 Parish Drive Wayne, NJ 07470

P.O. DATE	DELIVERY	SHIP VIA	F.O.B. POINT	TERMS
10-23-03	12-23-03	Best Way	SP (pre-pay & add to inv.)	Net 30 days

ITEM	QTY	DESCRIPTION	UNIT PRICE	TOTAL
		Confirming, Do Not Duplicate		
1	48	Labor & material to supply fuel injector segmented tip casting in accordance with ABT drawing 03008-400-A03-D01.		
2	48	Labor & material to supply throat casting assembly in accordance with ABT drawings 03008-300-A12-D01 and 03008-300-A12-DO (each assembly to be cast as one piece).		
3	1 lot	Labor & material to fabricate patterns for PO Items 1 & 2.		
a	-	**Shipping:** - Fax BOL & items list to Sal Ferrara upon shipment. - Documents to list this PO No. A03-008-411. - PCW phone no. is 973-696-1200.		
b	-	**Tax Note:** - Do not include sales, use or Federal excise taxes.		
c	-	**References:** - ABT drawing transmittal/bid request dated 10/21/03. - Alcon Quotation no. C6740 Rev 1 dated 10/22/03. - ABT Standard Terms & Conditions for Castings		

Authorized by 10-23-03
Date

1. Please send two copies of your invoice.
2. Enter this order in accordance with the prices, terms, delivery method, and Specifications listed above.
3. Send all correspondence to: Advanced Burner Technologies Corporation at address listed at head of this document.

ADVANCED BURNER TECHNOLOGIES

8.1

271 Route 202/206
P.O. Box 410
Pluckemin, NJ 07978
P 908.470.0470
F 908.470.0479
www.advancedburner.com

PURCHASE ORDER

The following numbers must appear on all related correspondence, shipping papers and invoices: **P.O. NUMBER: A03-008-410**

To: Passaic County Welders, Inc. 100 Parish Drive Wayne, NJ 07470	Ship To: Intermountain Generating Station 850 West Brush Wellman Road Delta, Utah 84624

P.O. DATE	DELIVERY	SHIP VIA	F.O.B. POINT	TERMS
9-17-03 (verbal)	02-13-04	Best Way	SP (pre-pay & add to inv.)	Net 30 days

ITEM	QTY	DESCRIPTION	UNIT PRICE	TOTAL
		Confirming, Do Not Duplicate		
1	48	Labor & material to supply complete Air Register/Fuel Injector Assembly according to drawings listed on ABT document transmittals to PCW dated 10/14/03 and 10/17/03 (except all 309 SS plate material will be substituted with 253 MA).		
a	-	**Shipping:** - Fax BOL & items list to Sal Ferrara upon shipment. -Documents to list this PO & IPSC Contract # 04-45606. - Intermountain Station phone no.is 435-864-6670.		
b	-	**Tax Note:** - Do not include sales, use or Federal excise taxes.		
c	-	**References:** - ABT quote request letter dated August 14, 2003. - PCW proposal letter dated August 21, 2003. - C. Onaitis 9/29/03 email drawing transmittal to PCW. - PCW proposal letter dated October 8, 2003. - ABT Standard Terms & Conditions (attached to PO)		

Authorized by 10-23-03 Date

1. Please send two copies of your invoice.
2. Enter this order in accordance with the prices, terms, delivery method, and Specifications listed above.
3. Send all correspondence to: Advanced Burner Technologies Corporation at address listed at head of this document.

COPY

ADVANCED BURNER TECHNOLOGIES

271 Route 202/206
P.O. Box 410
Pluckemin, NJ 07978
P 908.470.0470
F 908.470.0479
www.advancedburner.com

SB ORIGINAL

PAY REQ

COPY

Invoice

DATE	INVOICE #
11/11/2003	A03008-3

BILL TO	SHIP TO
Intermountain Power Service Corporation Attn: Accounts Payable Department 850 West Brush Wellman Road Delta, UT 84624-9546	Intermountain Power Service Corporation Attn: James Nelson 850 West Brush Wellman Road Delta, UT 84624-9546

P.O. NUMBER	TERMS	REP	SHIP	VIA	F.O.B.	PROJECT
04-45606	Upon Receipt		2/13/2004	Best Way	Delta, UT	A03008

QUANTITY	ITEM CODE	DESCRIPTION	PRICE EACH	AMOUNT
1	1	Submittal of Burner General Arrangements	247,122.00	247,122.00

11-20-03
Phil,
Please process
-if ok to pay.
Thanks!
Sheila

PAYMENT AUTHORIZATION #
WORK RELEASE # 04-45606-001
SERVICE CONTRACT # 04-45606
WORK ORDER # 03-96033-0
INVOICE # A03008-3
AMOUNT $ 247,122.00
DATE TO SUBMIT BY 11 / 24 / 03

Arrangement Drawings Received.
ok to pay.
Phil Hailes
11/24/03

RECEIVED
NOV 17 2003
IPSC Accounting

VENDOR # 8025 REMIT TO #
VOUCHER #
AMT PAID $ 247,122.00
CHECK NO DUE DATE 11 / 03

11-20-03
Phil, Hailes,
please process
-if ok to pay.
Thanks! Sheila

Total SB $247,122.00

IP7_030972

ADVANCED BURNER TECHNOLOGIES

271 Route 202/206
P.O. Box 410
Pluckemin, NJ 07978
P 908.470.0470
F 908.470.0479
www.advancedburner.com

COPY

SB ORIGINAL

Invoice

DATE	INVOICE #
1/20/2004	A03008-4

BILL TO	SHIP TO
Intermountain Power Service Corporation Attn: Accounts Payable Department 850 West Brush Wellman Road Delta, UT 84624-9546	Intermountain Power Service Corporation Attn: James Nelson 850 West Brush Wellman Road Delta, UT 84624-9546

COPY

P.O. NUMBER	TERMS	REP	SHIP	VIA	F.O.B.	PROJECT
04-45606	Upon Receipt		2/13/2004	Best Way	Delta, UT	A03008

QUANTITY	ITEM CODE	DESCRIPTION	PRICE EACH	AMOUNT
1	1	30% Commence fabrication	741,365.00	741,365.00

1-23-04
Phil,
Please process
if okay to pay.
thanks Sheila

ok to pay
Phil Hanks

PAYMENT AUTHORIZATION #
WORK RELEASE #
SERVICE CONTRACT # 04-45606
WORK ORDER # 03-96033-0
INVOICE # A03008-4
AMOUNT $ 741,365.00
DATE TO SUBMIT BY 1/26/04

VENDOR # 8075 REMIT TO #
VOUCHER #
AMT PAID $ 741,365.00
CHECK NO DUE DATE / /

Total $741,365.00

IP7_030973

BLANKET, CONTRACT, & PURCHASE ORDER REPORT BY CONTRACT ADMINISTRATOR

September 30, 2003

VENDOR NAME	state d	state S	VEND. NO.	P.O. NUMBER	COMMODITY / SERVICE	CONT. DATE	CURRENT CONT. AMT.	TOTAL PAID ON CURRENT	REMAINING BALANCE	EXPIRE. DATE	P/O TYPE	DEPT	CONT. ADMIN.	A/P CLERK RESP.	BUYER
ADVANCED BURNER TECH.			8075	04-45606	LOW Nox BURNERS FOR UNIT 2	09/17/03	2,531,218.00	0.00	2,531,218.00	04/20/04	OA	TEC	Phil H.	Sheila B.	Nancy B

(d) = CONTRACT EXPIRATION DATE OR ($) = AMOUNT MUST BE RENEWED BY CONTRACT ADMINISTRATOR.

IP7_030974

BLANKET, CONTRACT, & PURCHASE ORDER REPORT BY CONTRACT ADMINISTRATOR

January 31, 2004

VENDOR NAME	state d	state $	VEND. NO.	P.O. NUMBER	COMMODITY / SERVICE.	CONT. DATE	CURRENT CONT. AMT.	TOTAL PAID ON CURRENT	REMAINING BALANCE	EXPIRE. DATE	P/O TYPE	DEPT	CONT. ADMIN.	A/P CLERK RESP.	BUYER
ADVANCED BURNER TECH.			8075	04-45606	LOW Nox BURNERS FOR UNIT 2	09/17/03	2,648,038.00	524,244.00	2,123,794.00	04/20/04	OA	TEC	Phil H.	Sheila B.	Nancy B.

IP7_030975

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: DENNIS KILLIAN

FROM: SHEILA BRONSON

DATE: MARCH 5, 2004

SUBJECT: BLANKET/CONTRACT STATUS INFORMATION

FILE: 04-45606 Advanced Burner

Accounting has been asked to notify the Department Heads, and Contract Administrators when Blanket/Contract Purchase Orders are within 10% of their value, or approximately 60 days before expiration. Please use this information, along with the last Blanket/Contract Purchase Order Report. If the Accounting Department can help in any way feel free to contact myself, at extension #6521, or Sam Wardle at extension #6513.

Vendor Name: Advanced Burner

PO Number: 04-45606

PO Expiration Date: 04-20-04

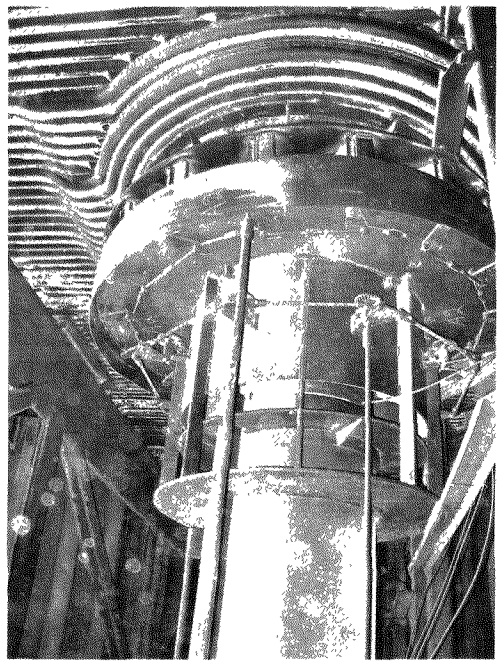
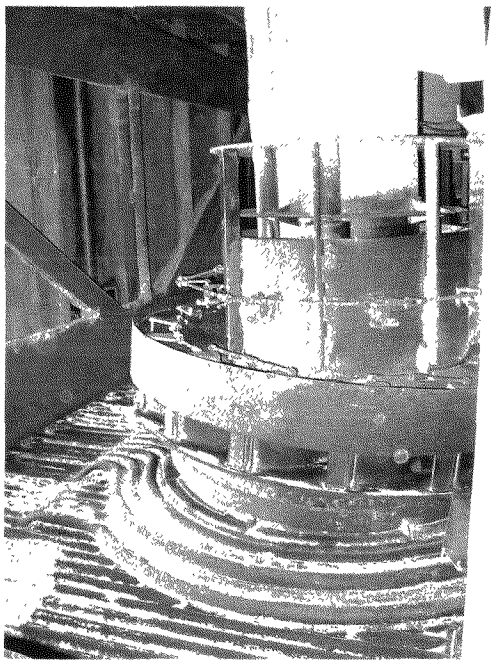
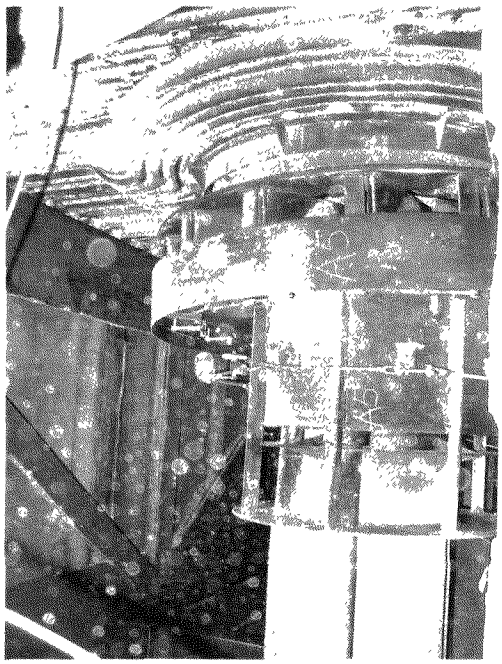
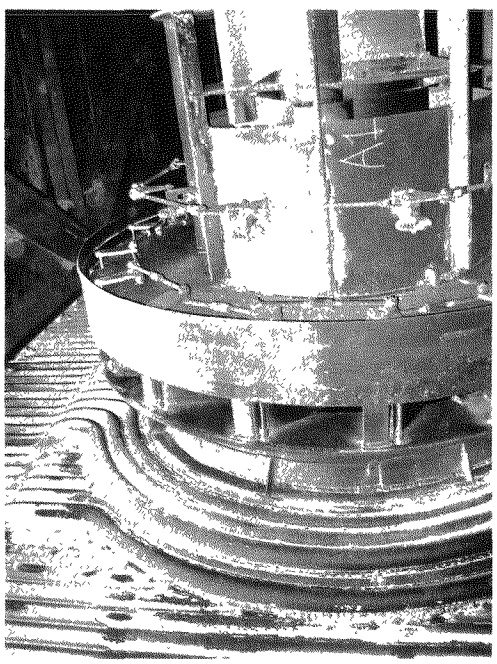
PO Dollar Balance: $1,382,429.00

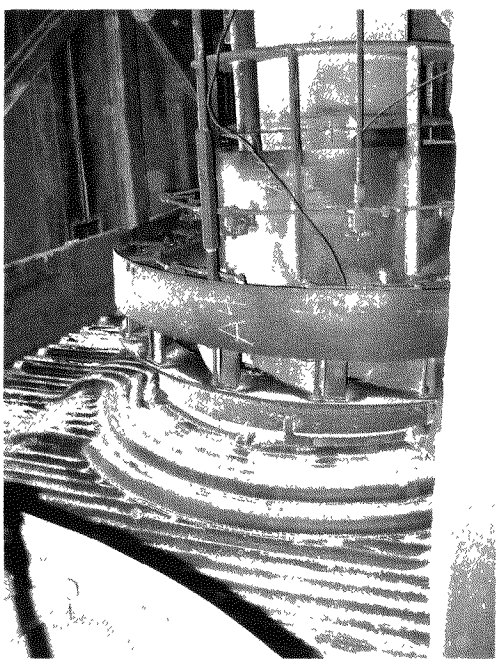
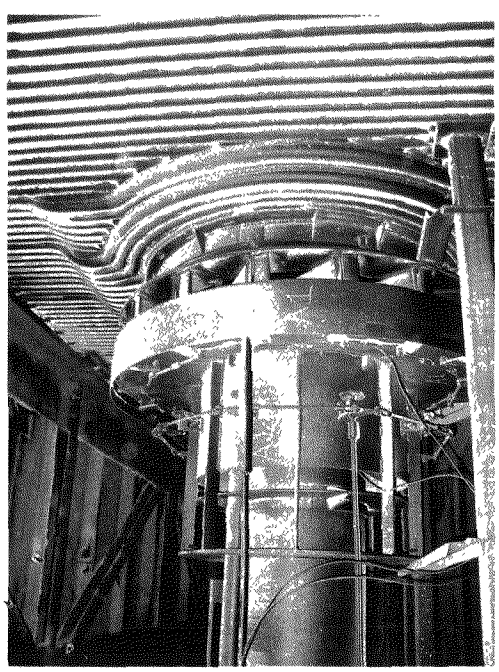
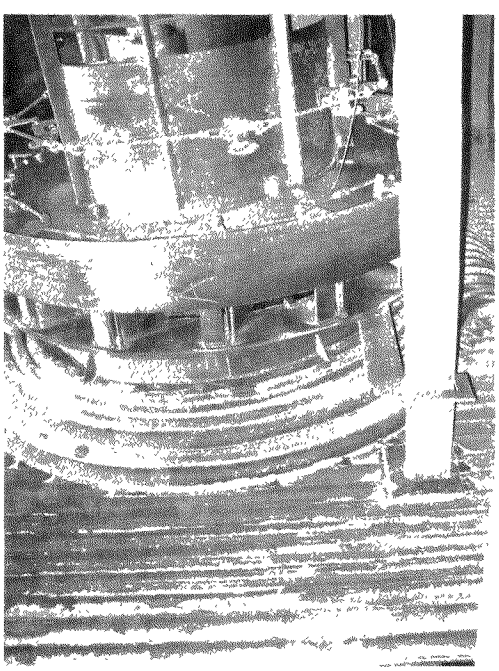
PO Quantity Balance:

Tons/Gallons:

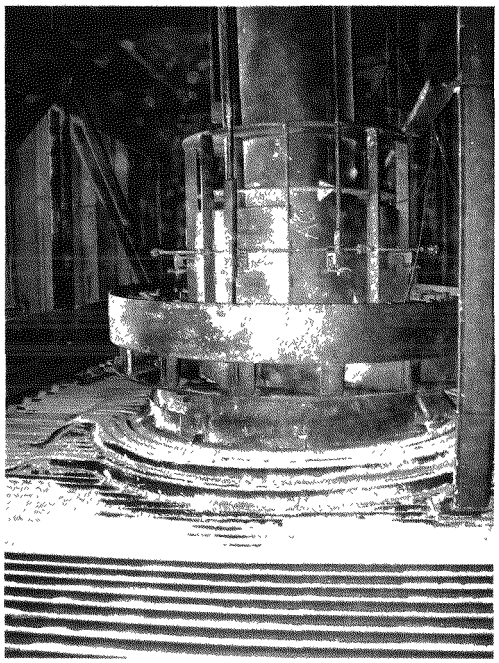
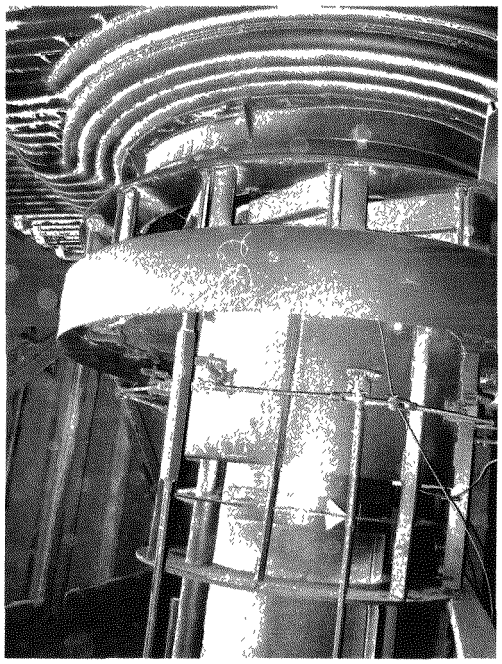
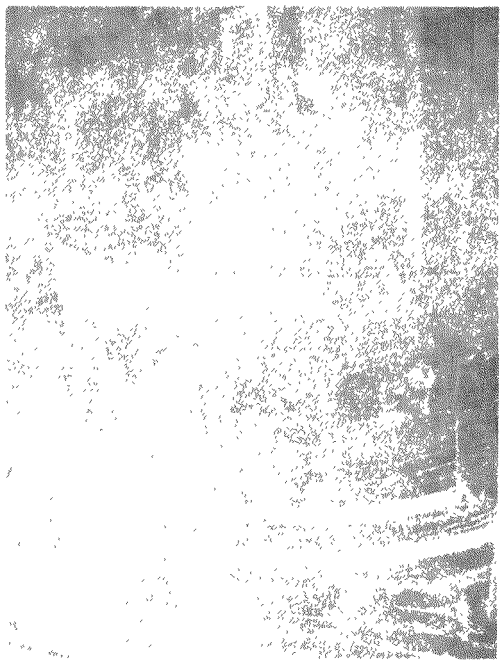
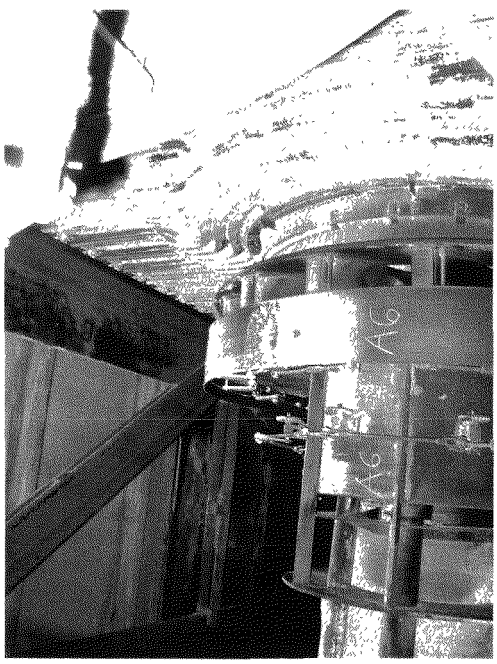
IPSC Buyer: Nancy Bennett

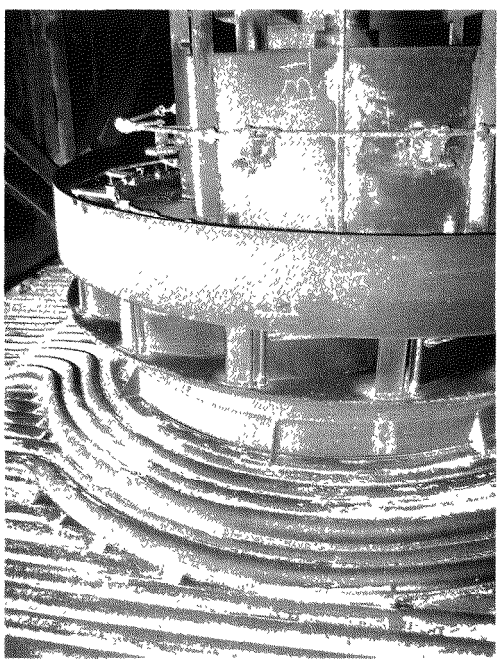
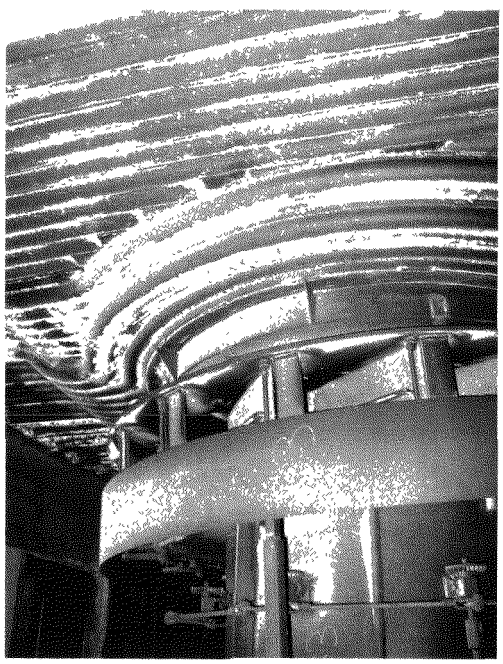
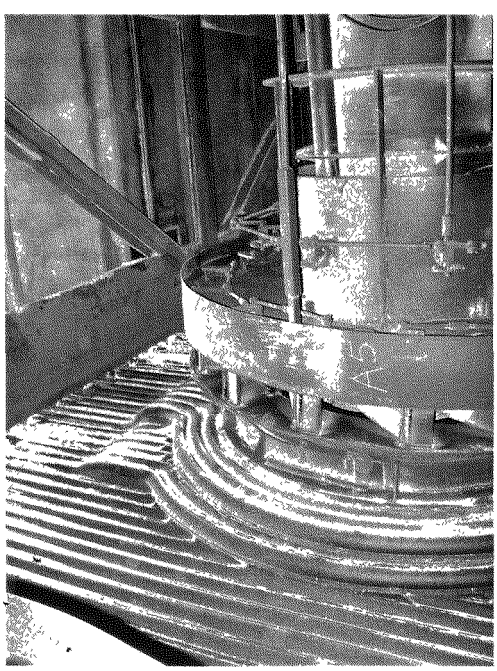
cc: Nancy Bennett, Phil Hailes

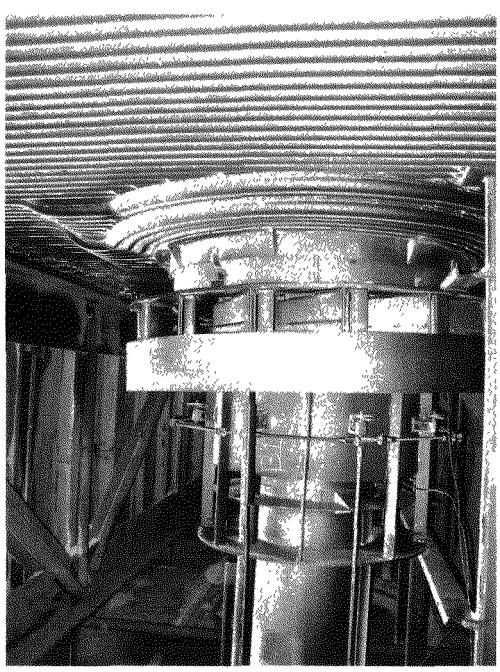
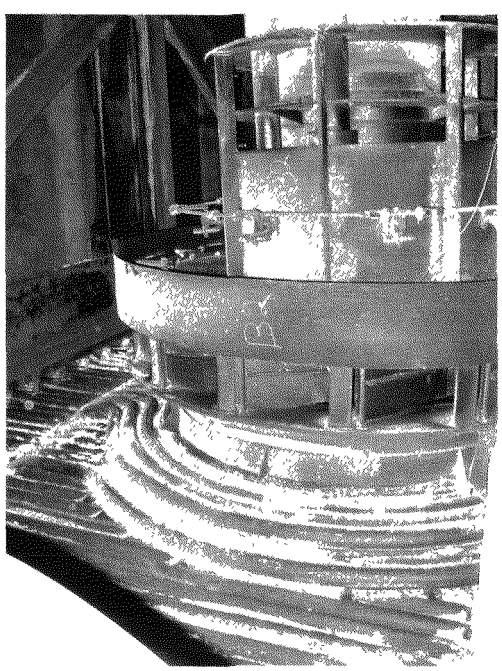





IP7_030977

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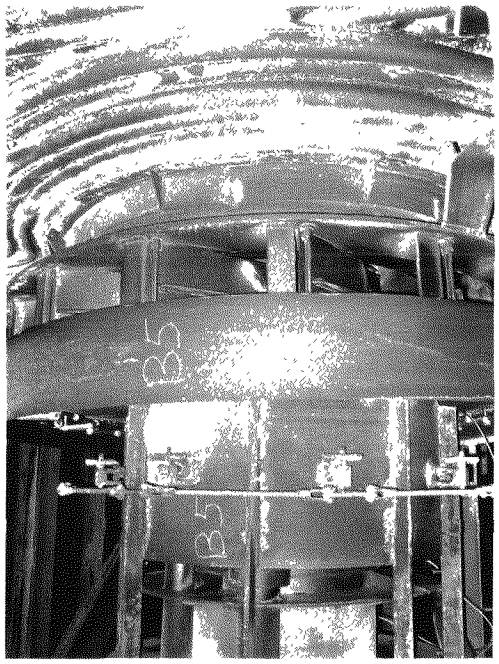

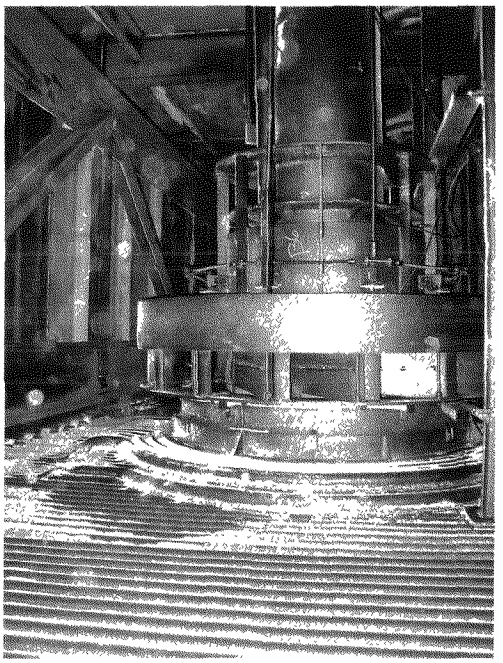

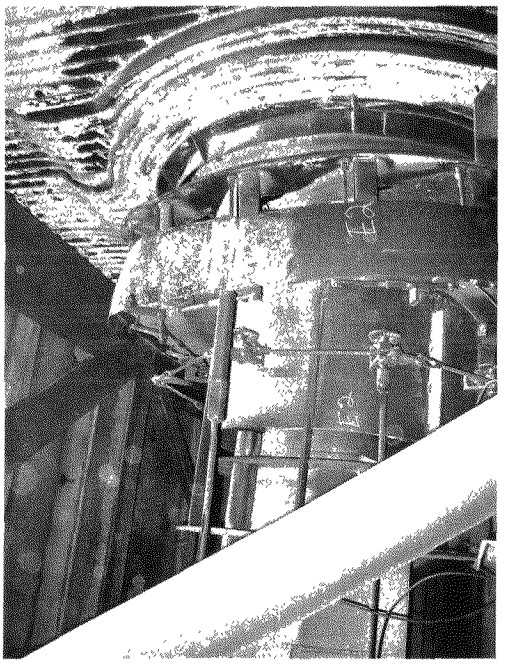

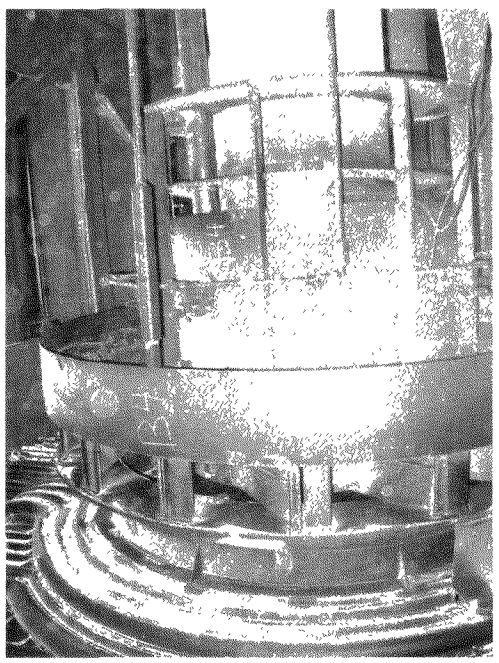

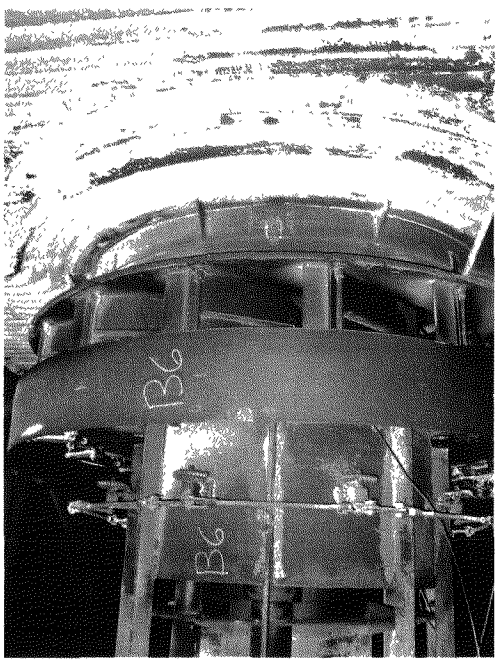

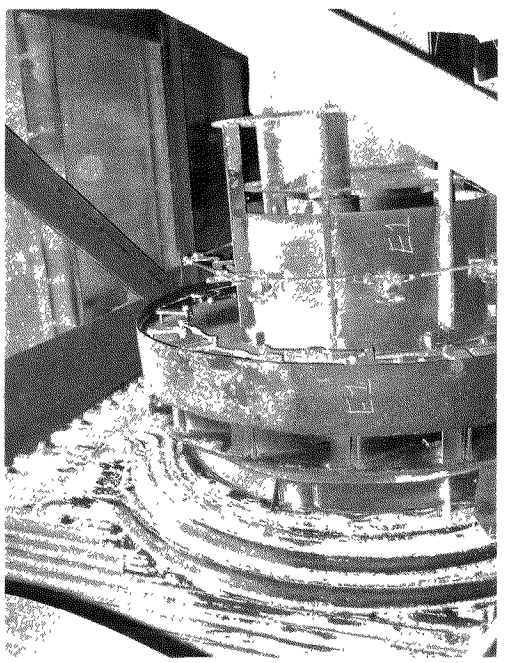

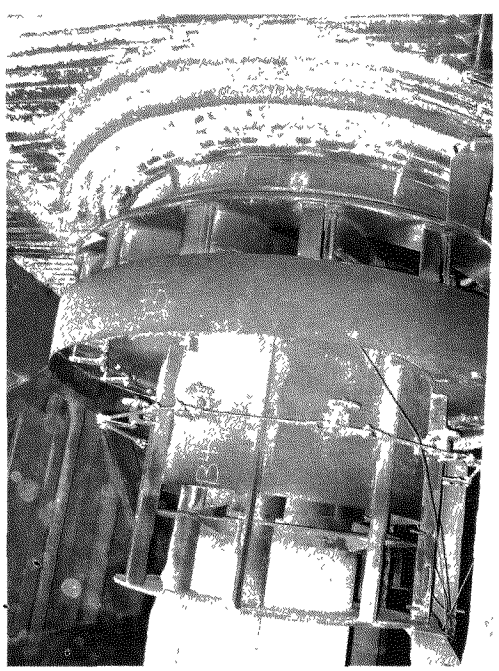

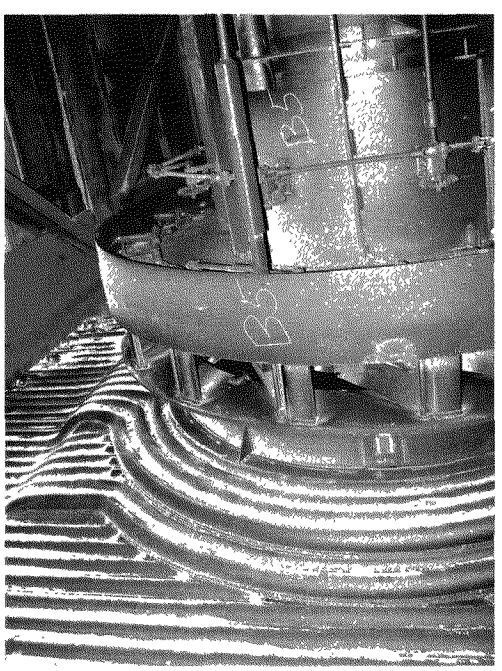

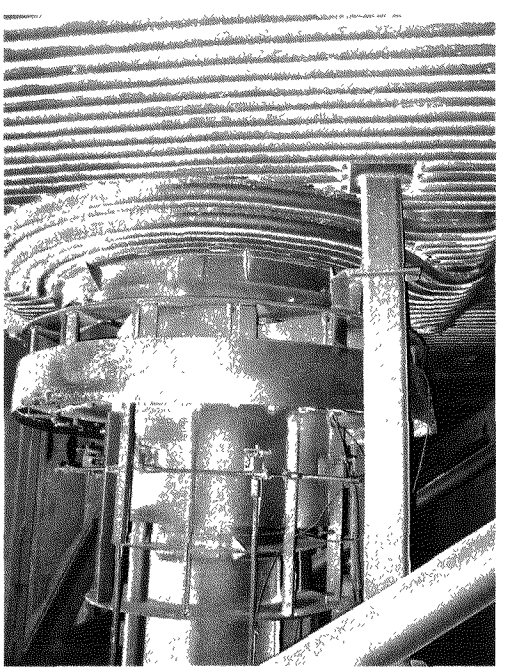

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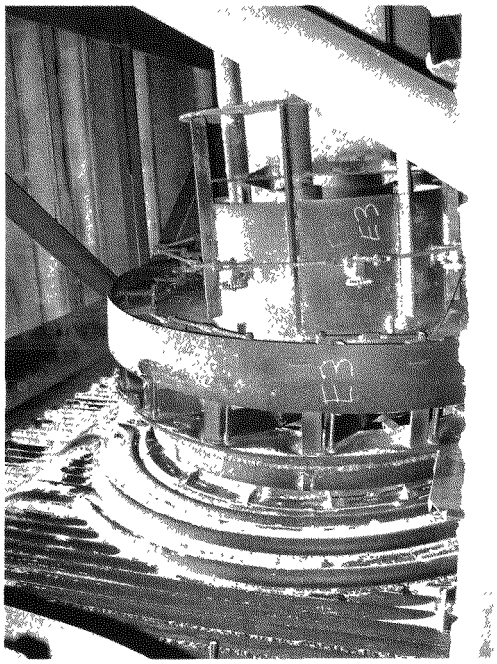

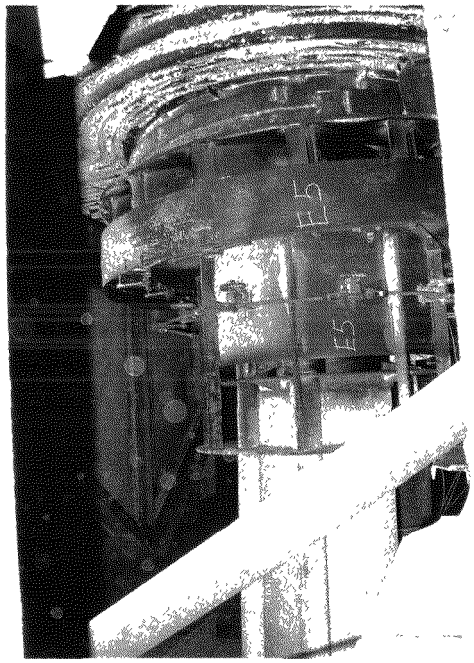

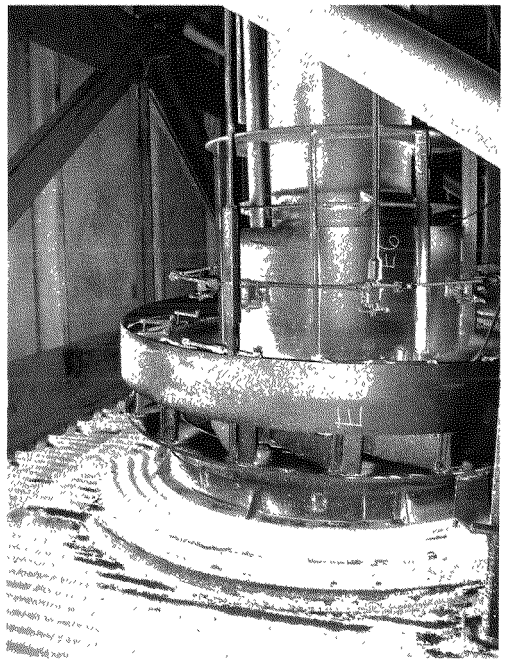

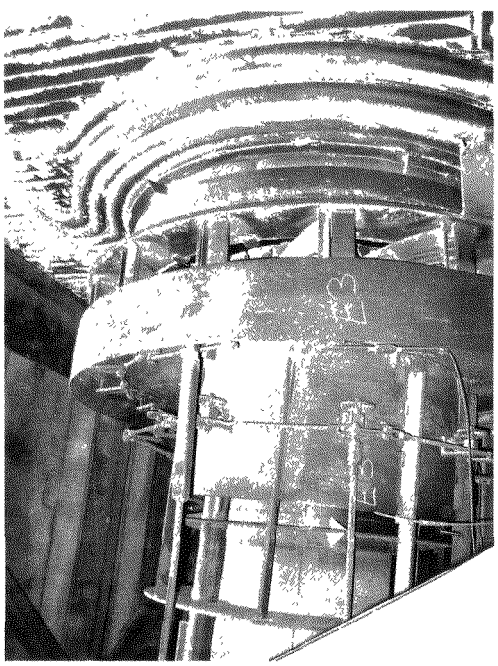

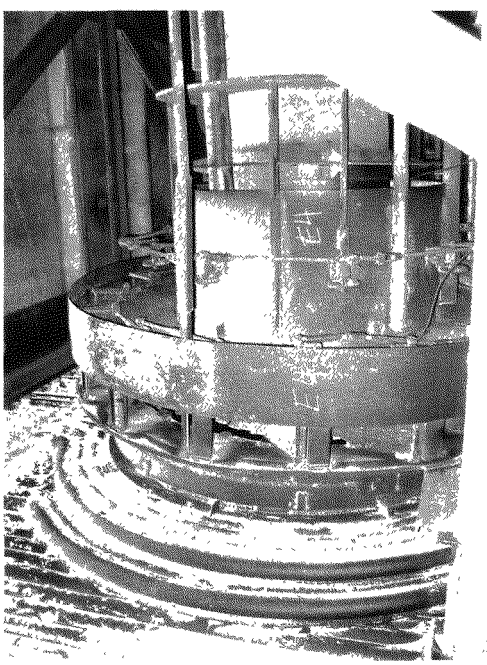

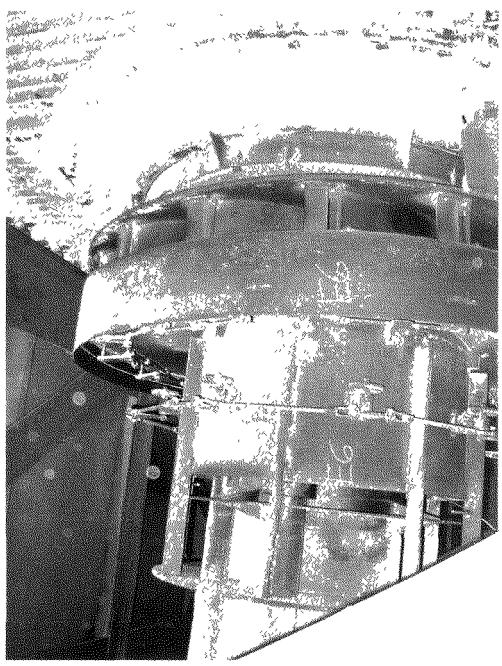

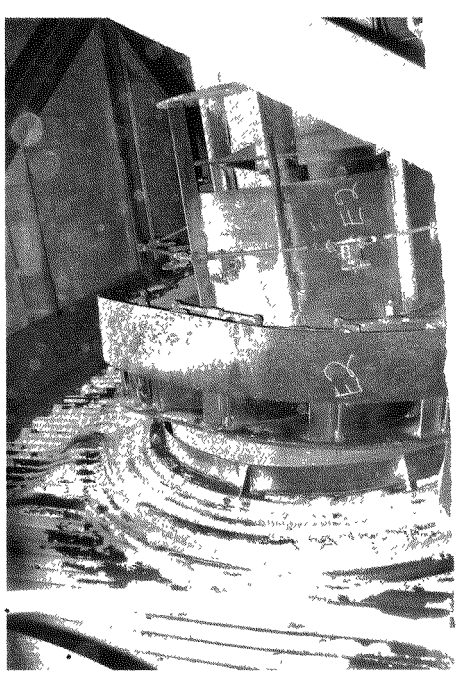

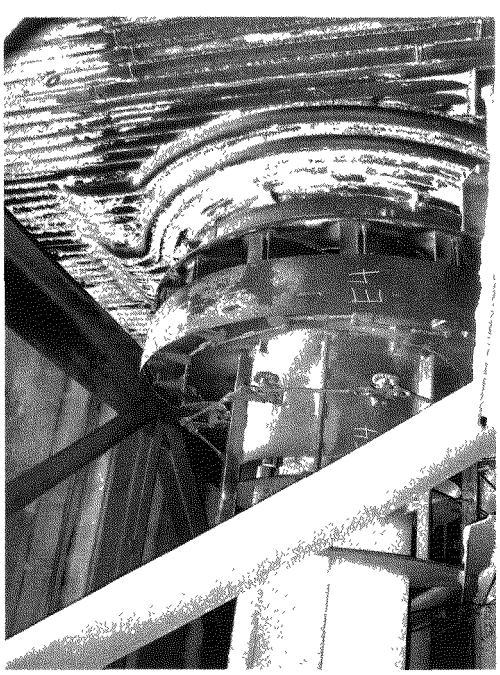

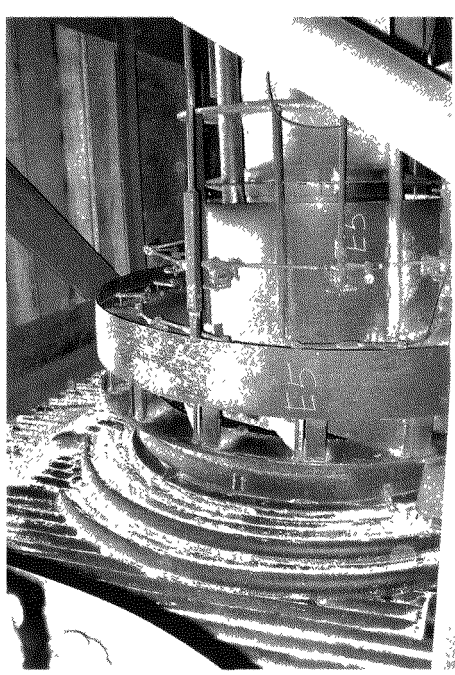

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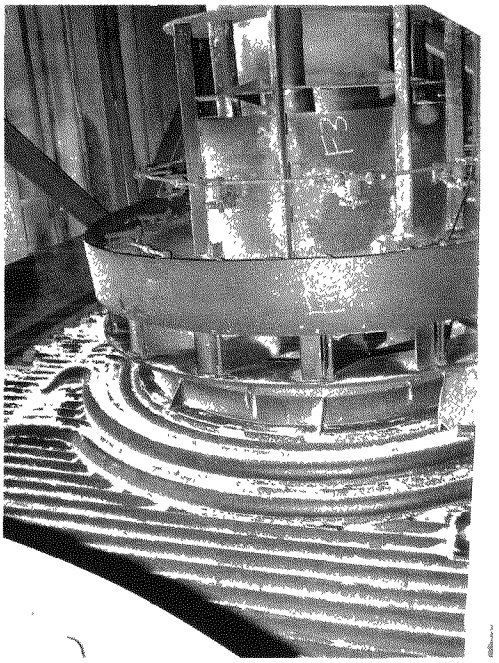
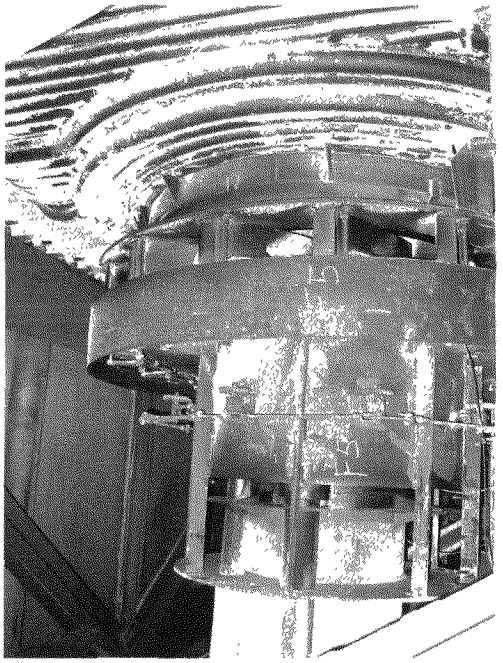
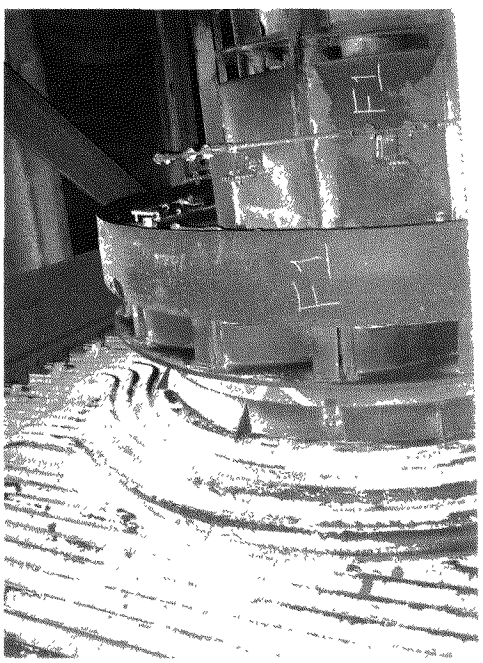
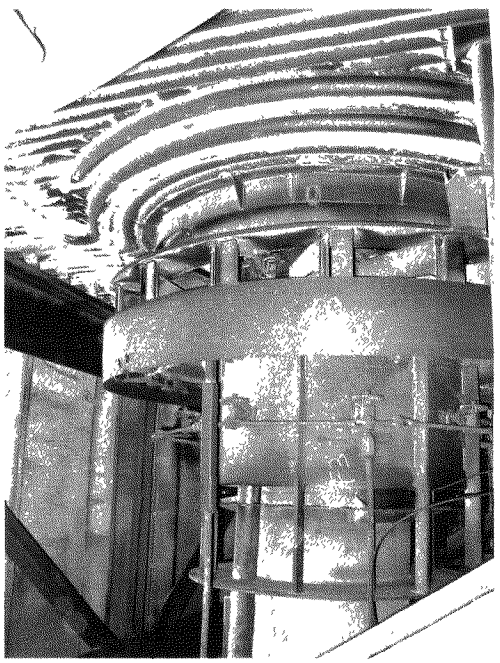
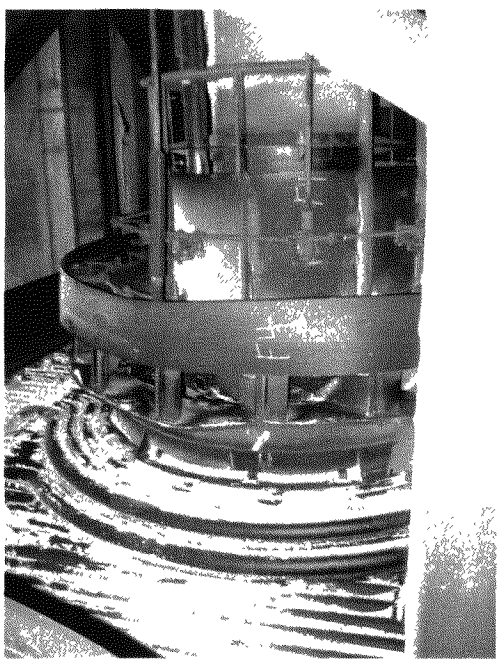
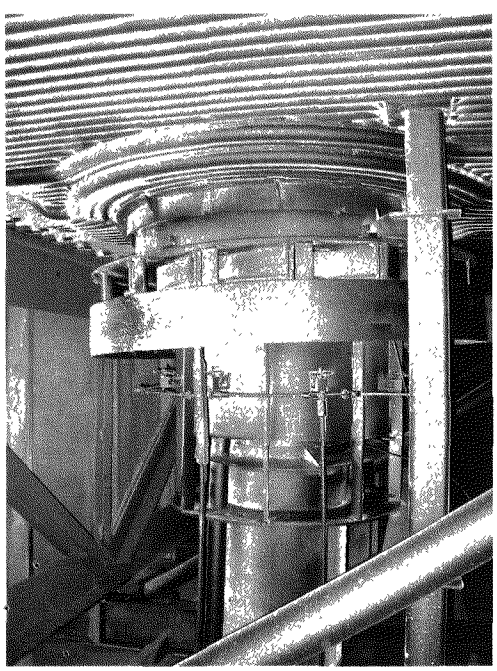
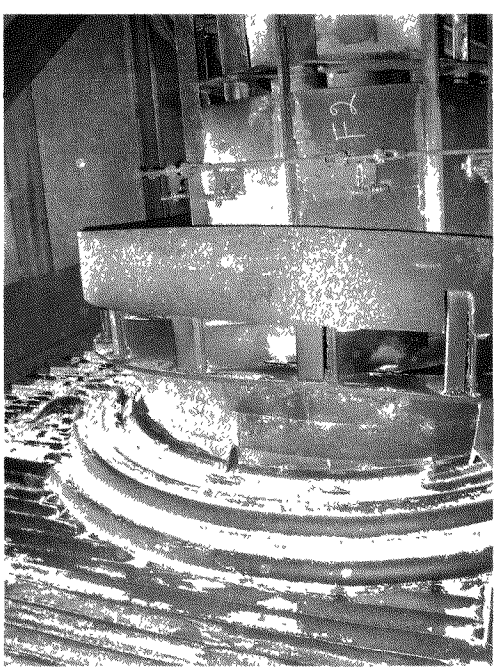
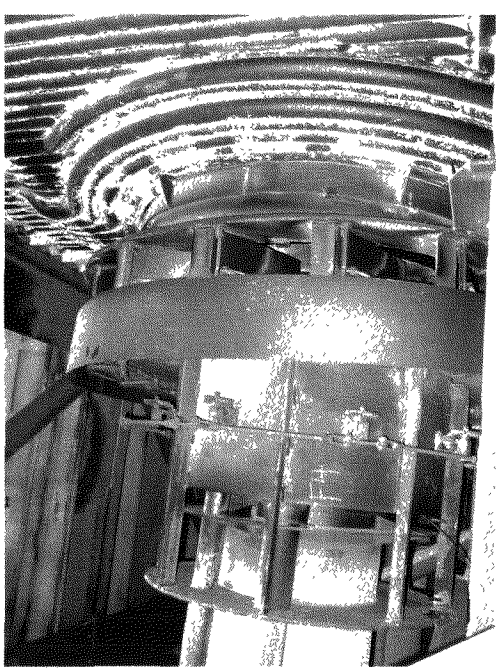

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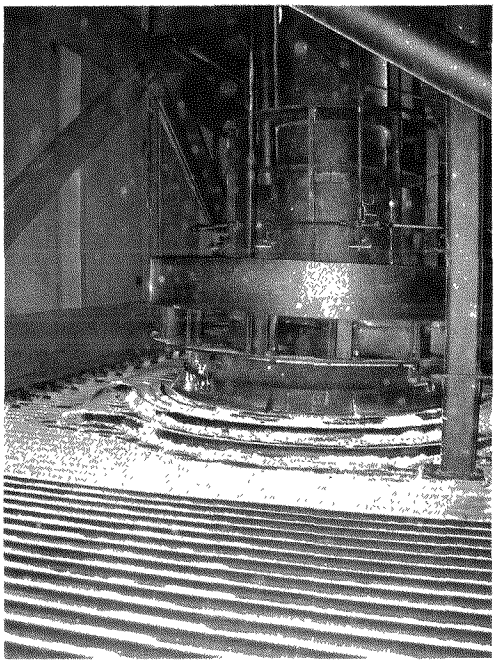

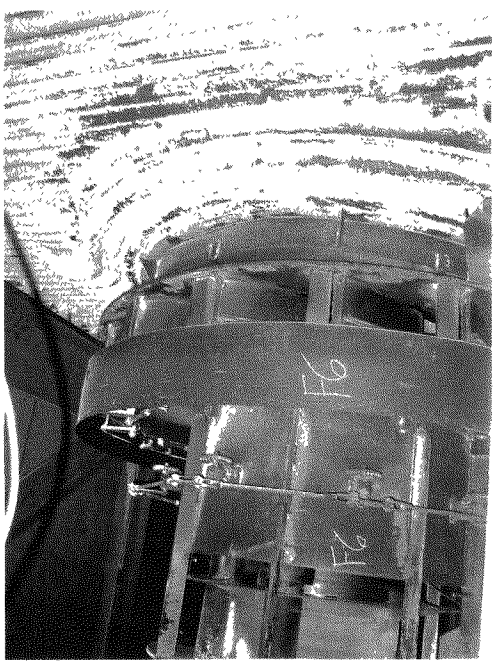

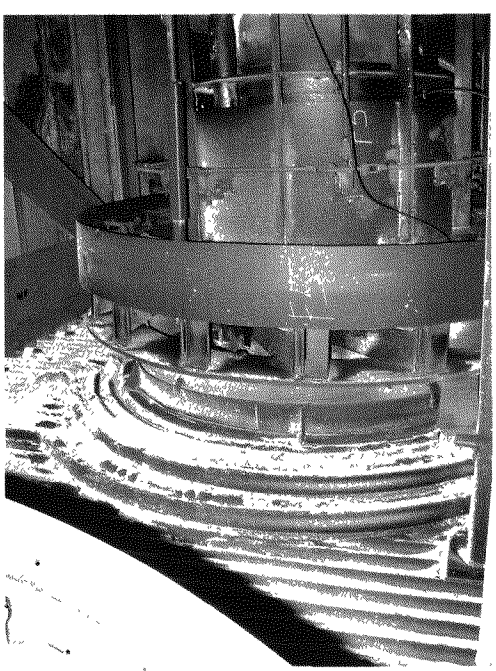

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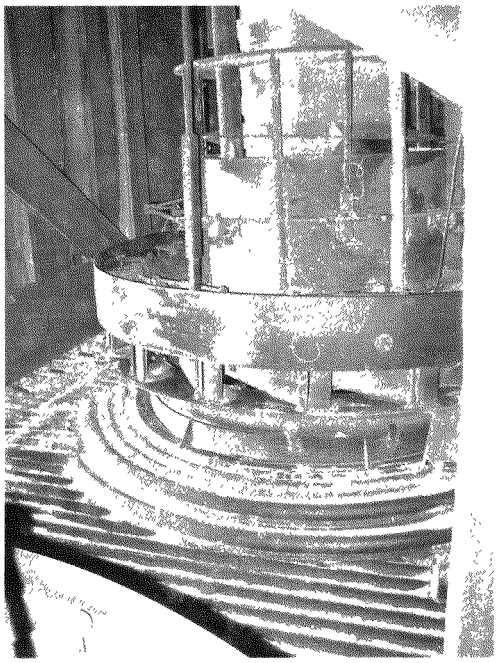
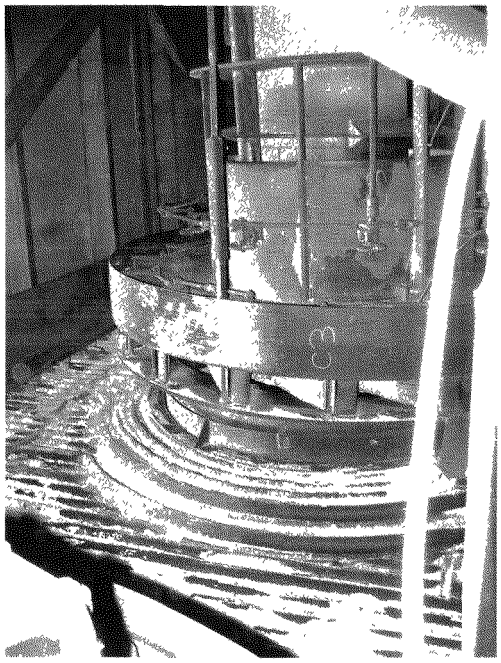
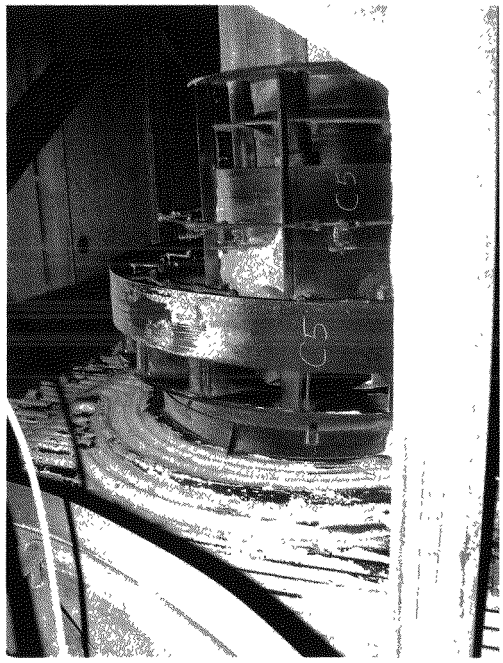
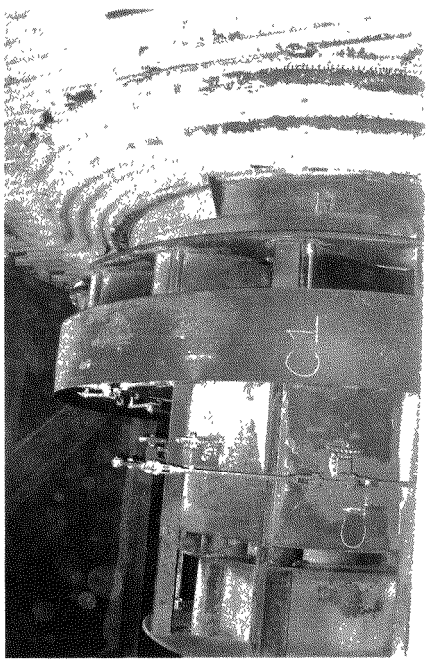
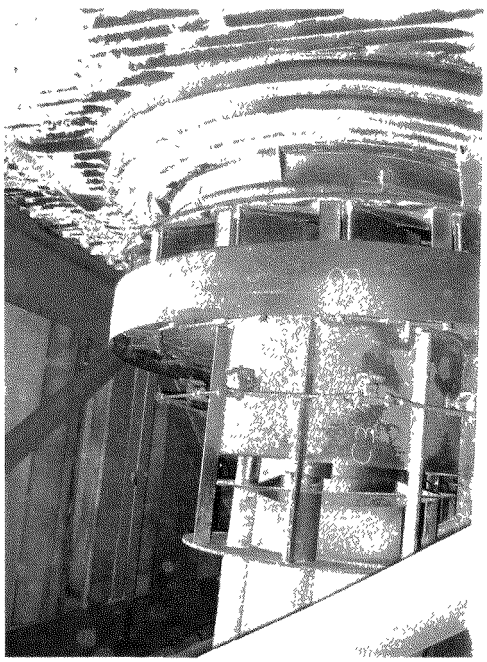
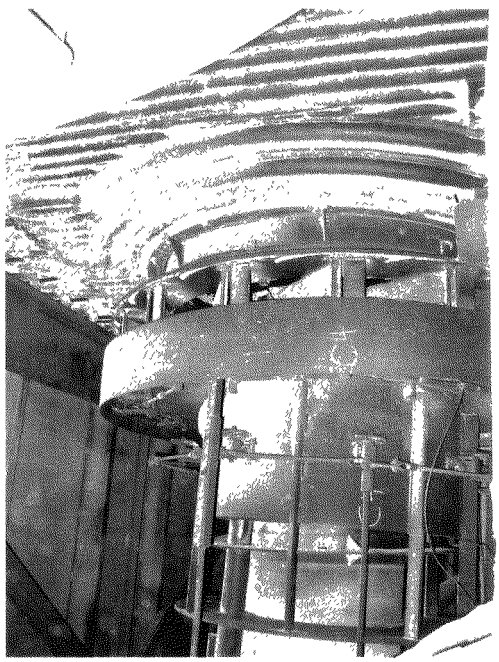
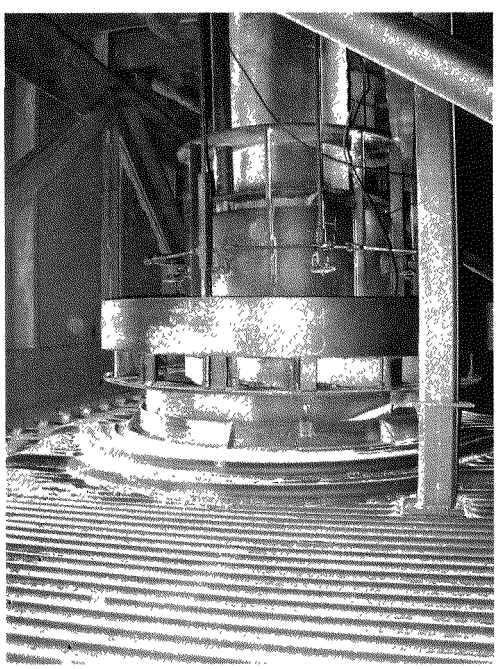
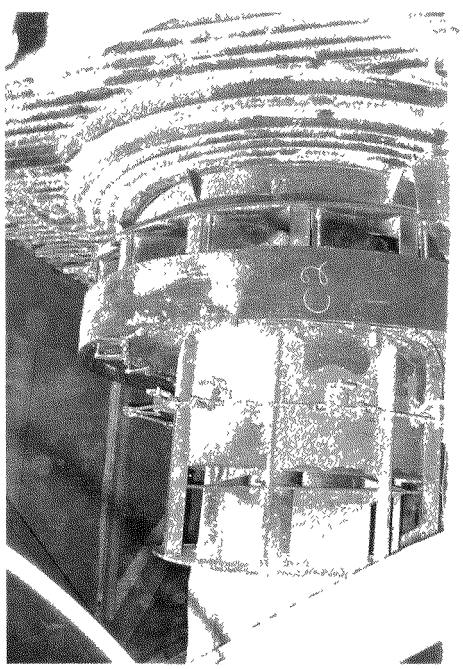
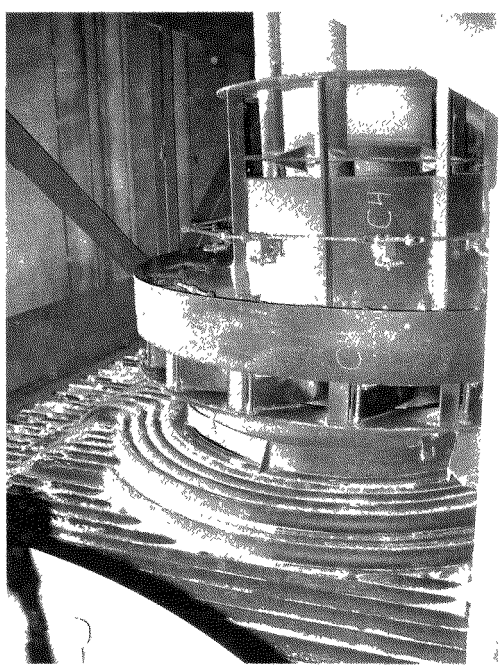

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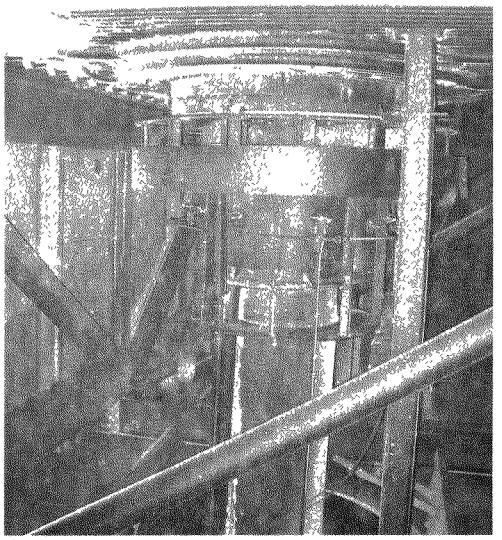

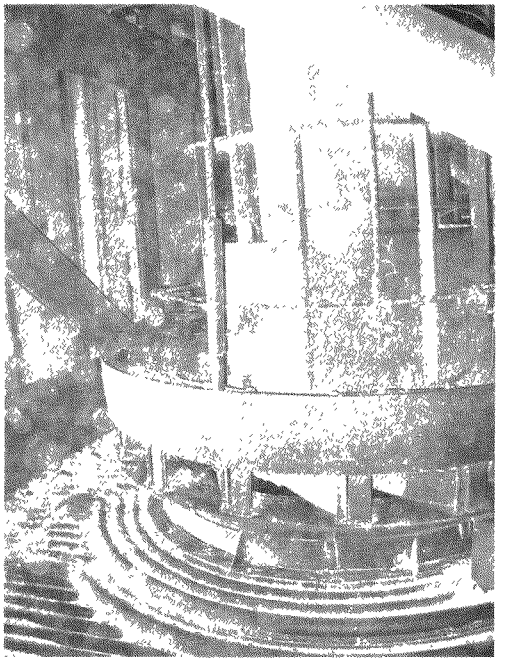

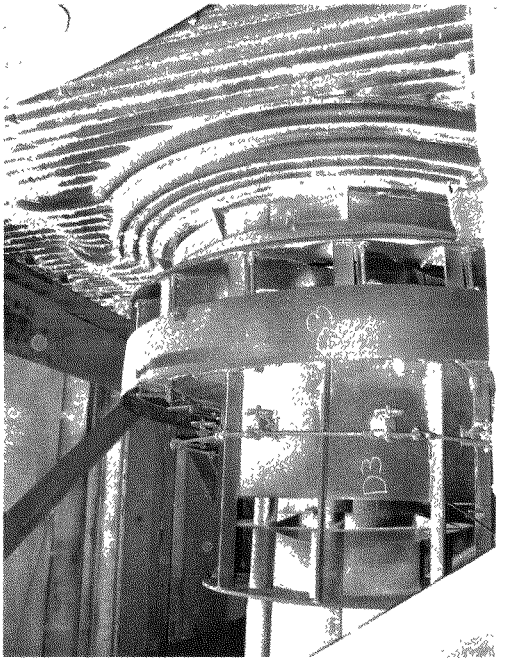

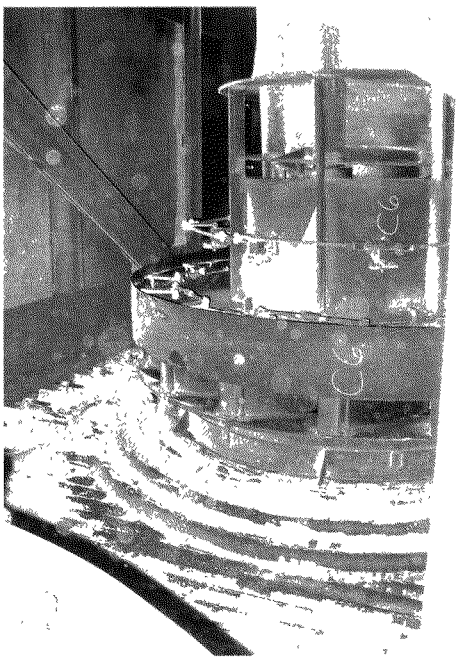

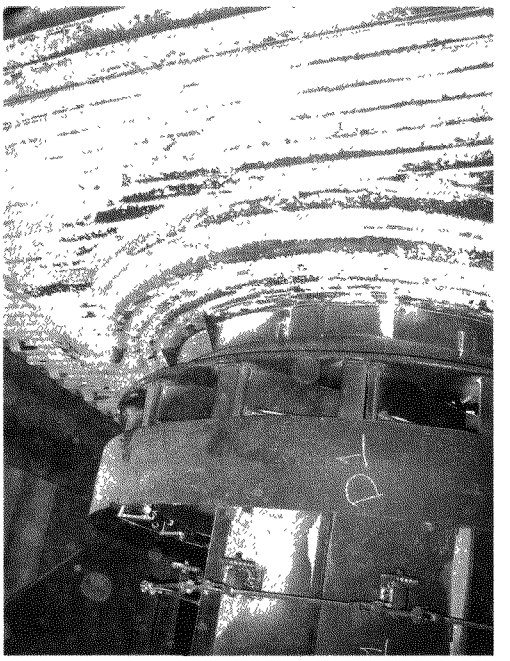

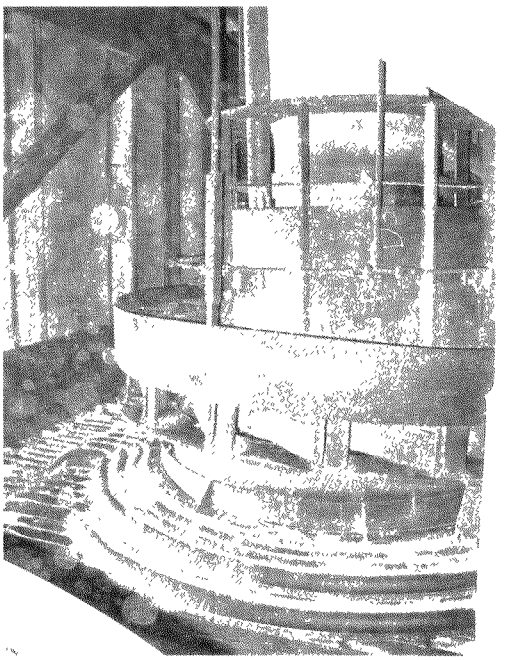

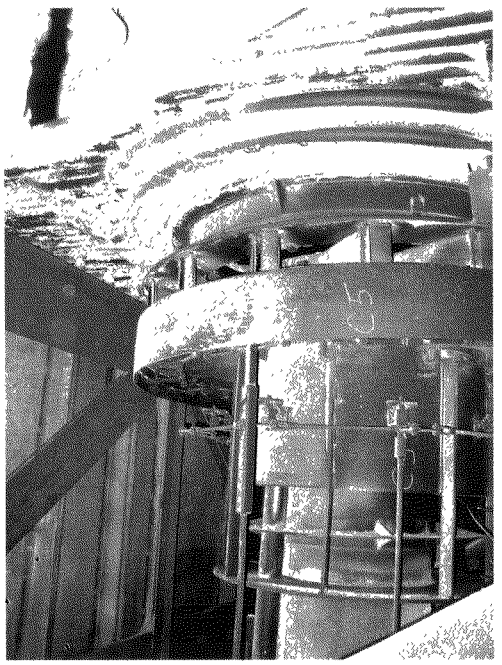

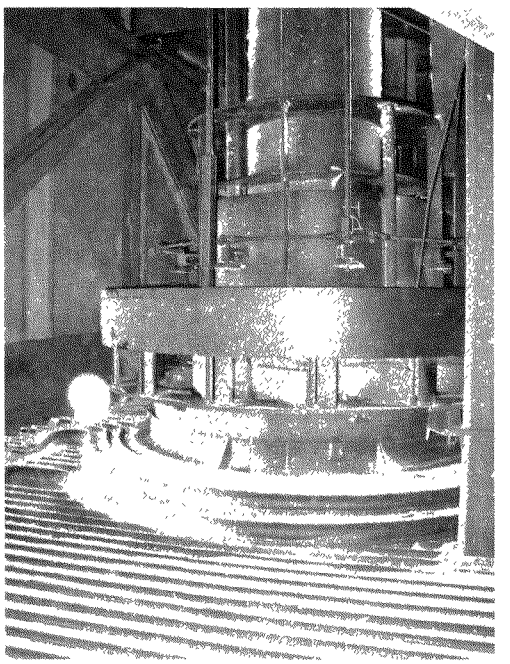

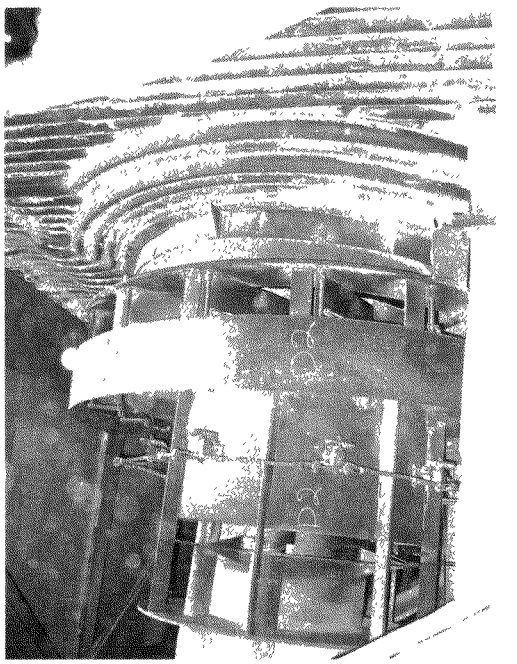

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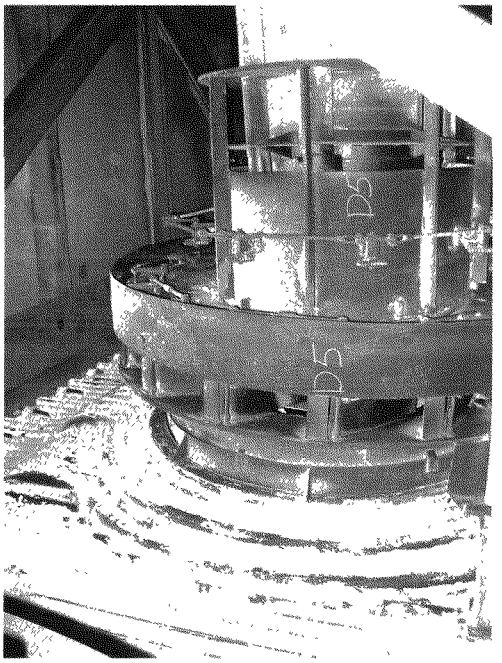
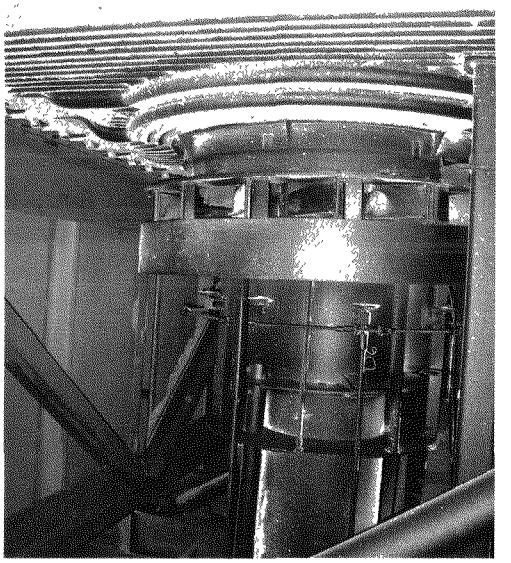
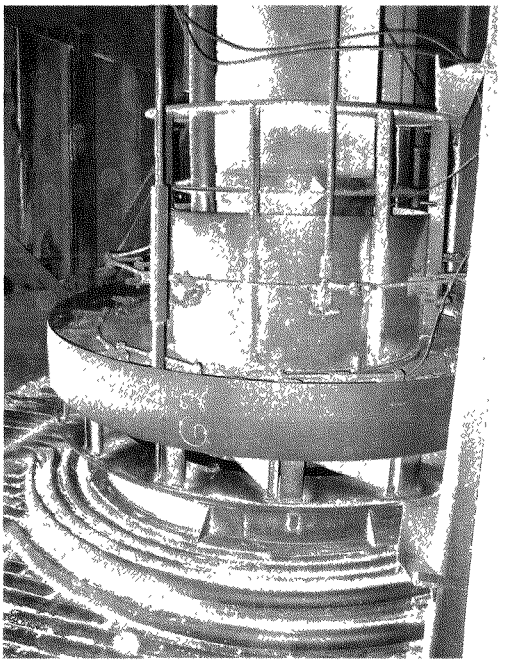
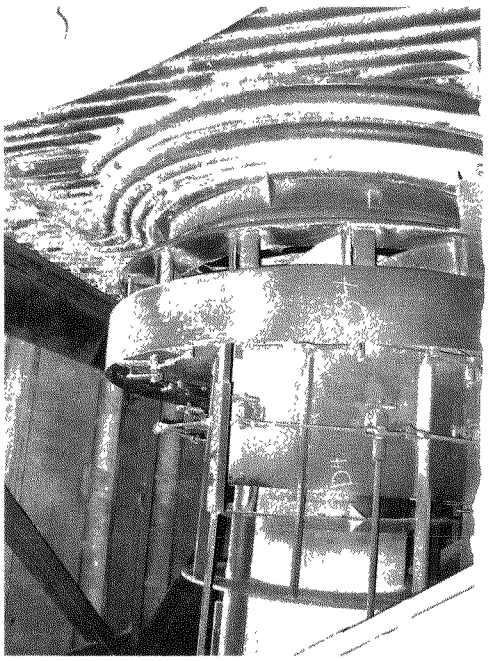
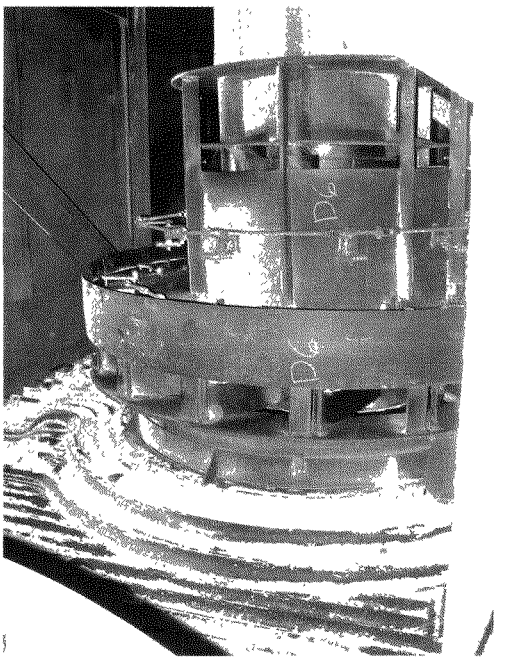

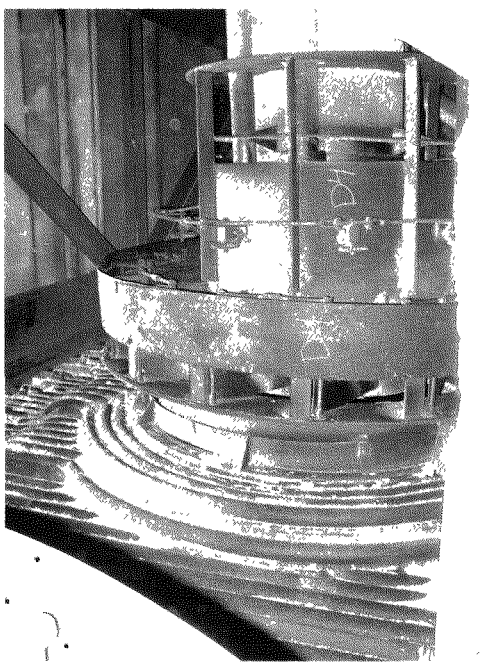
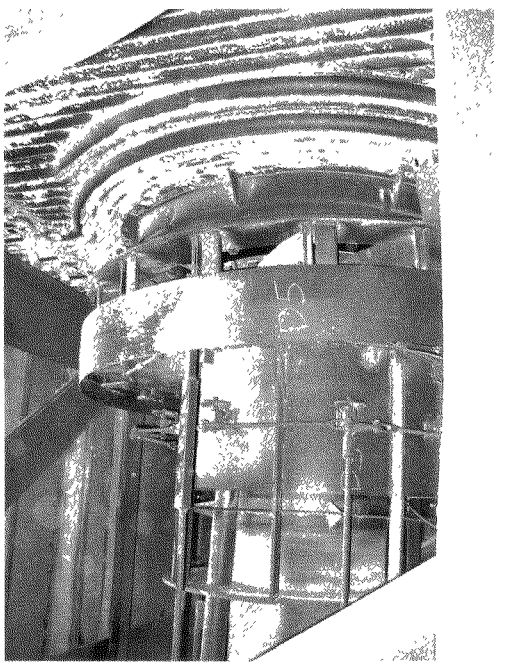
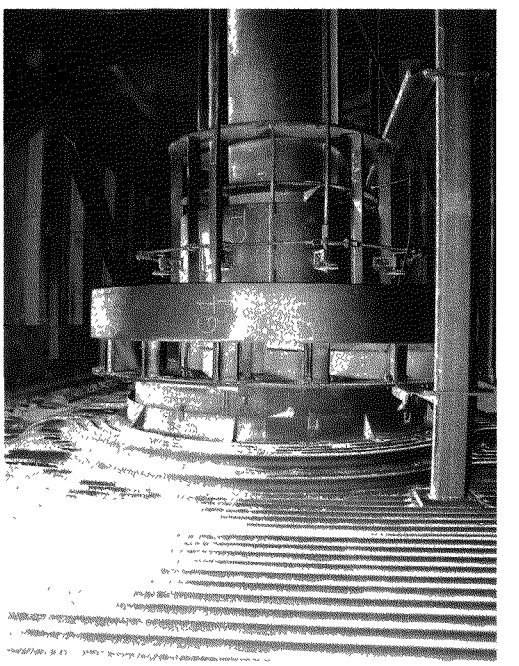

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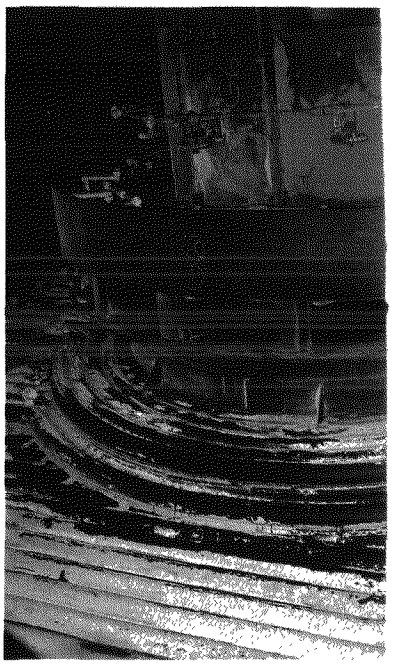
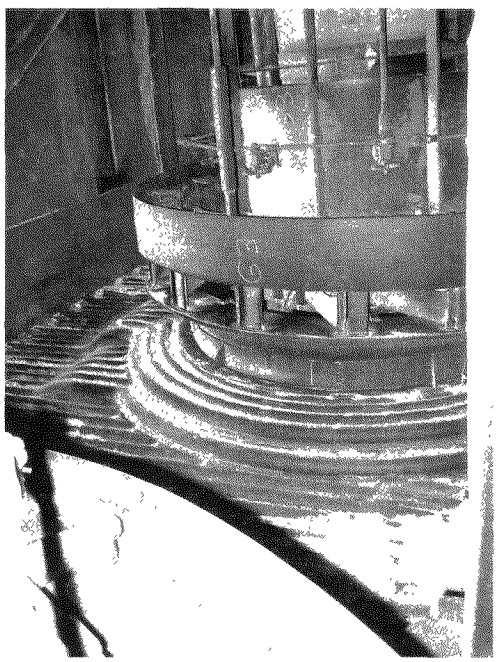
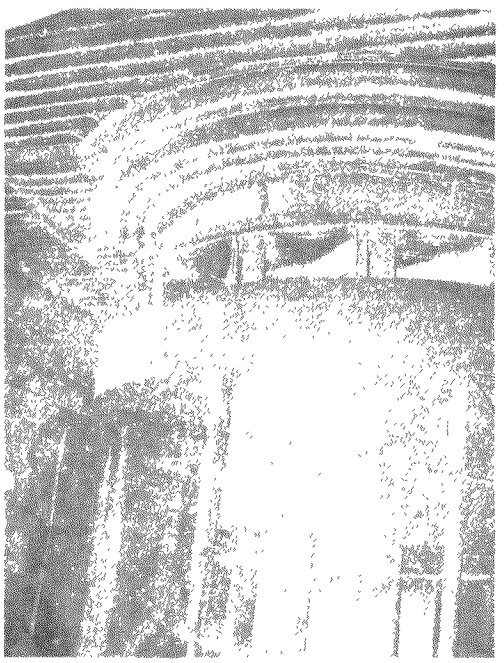
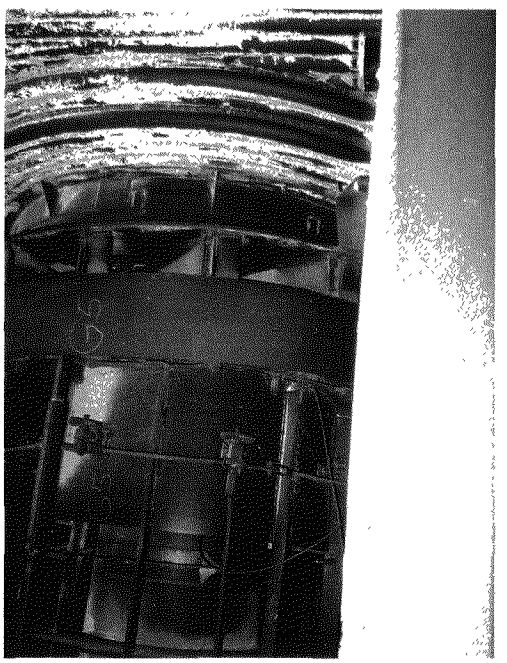

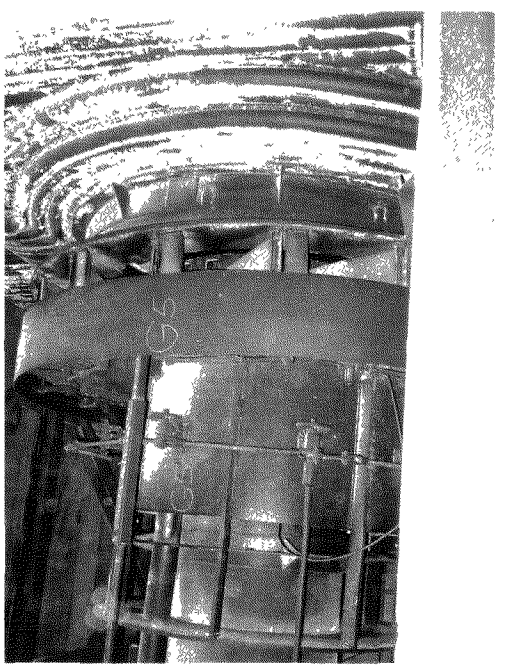

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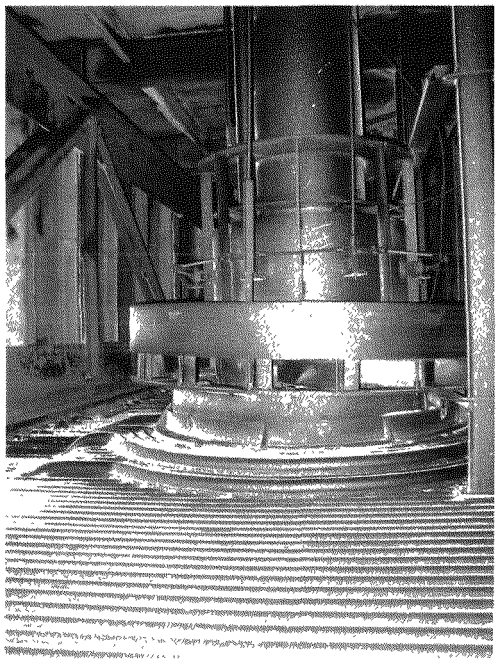
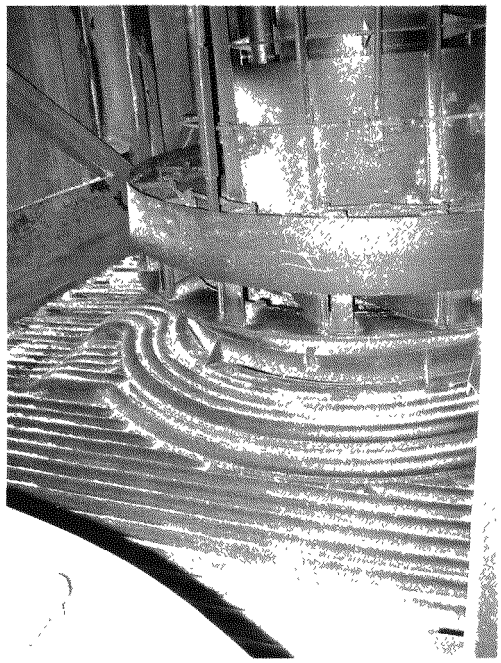

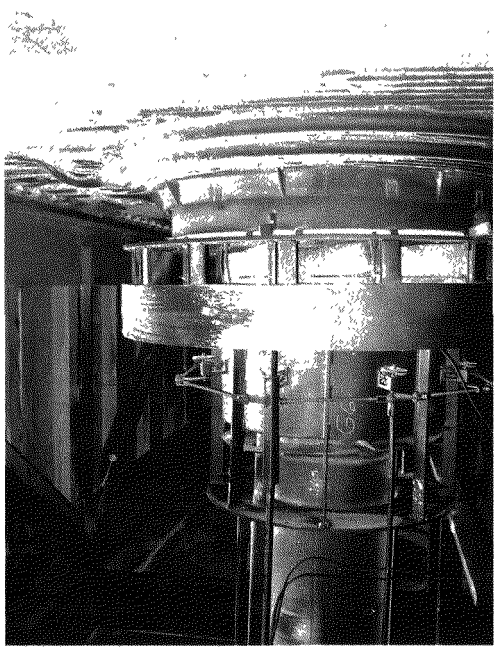
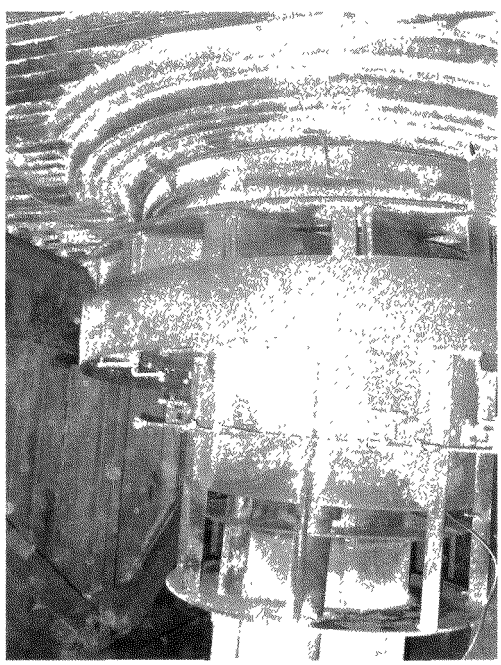

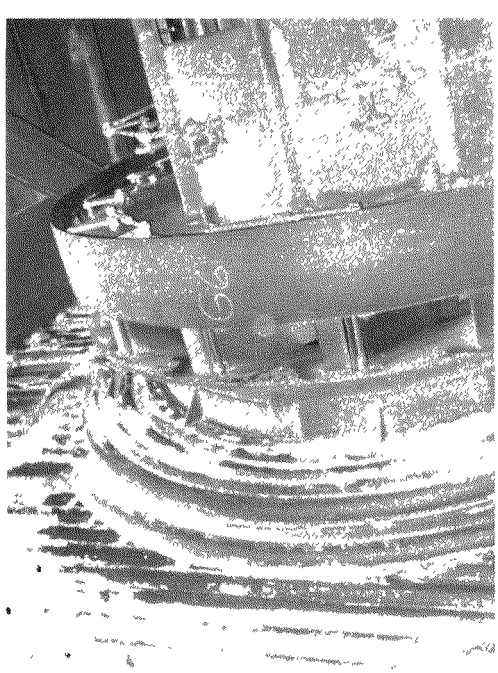
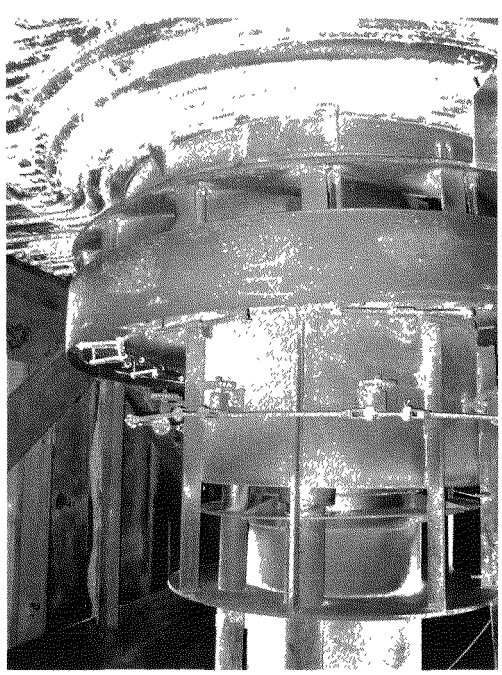

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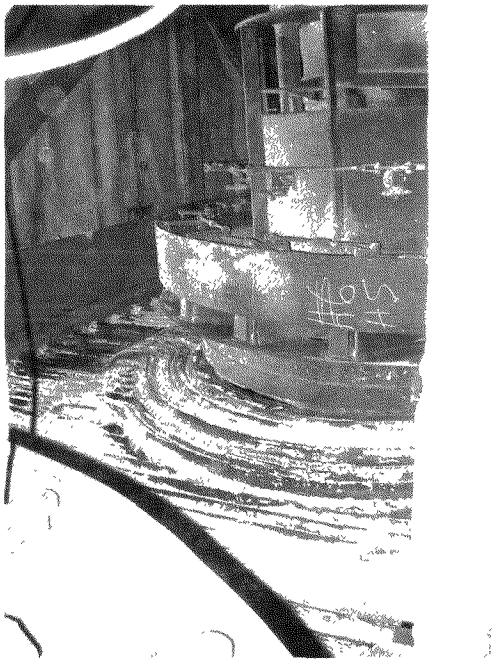
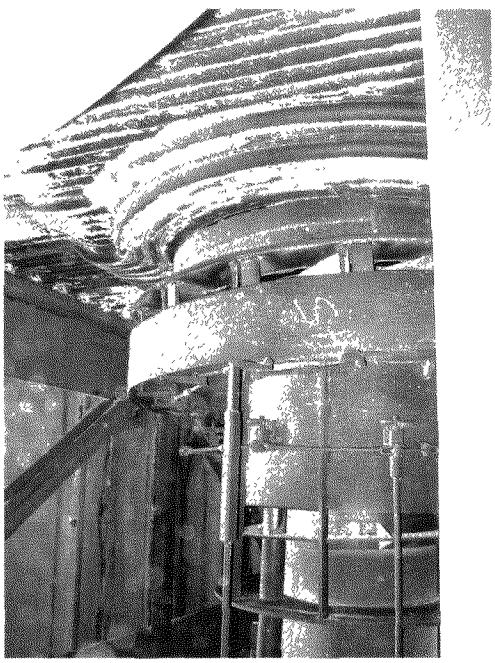
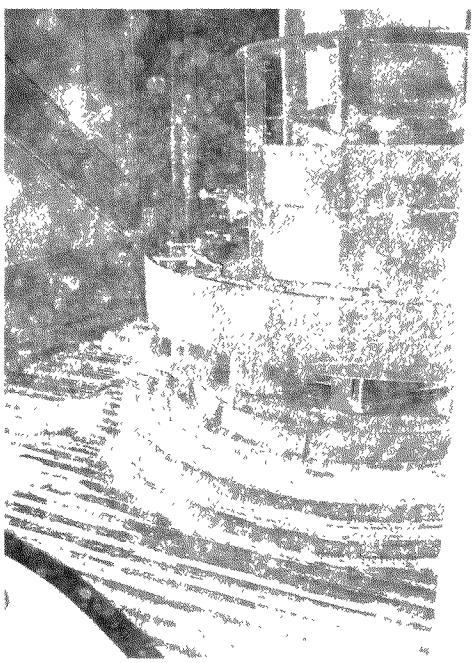
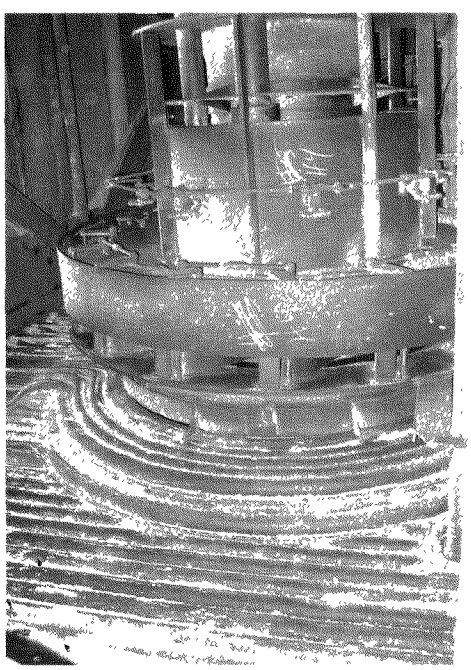
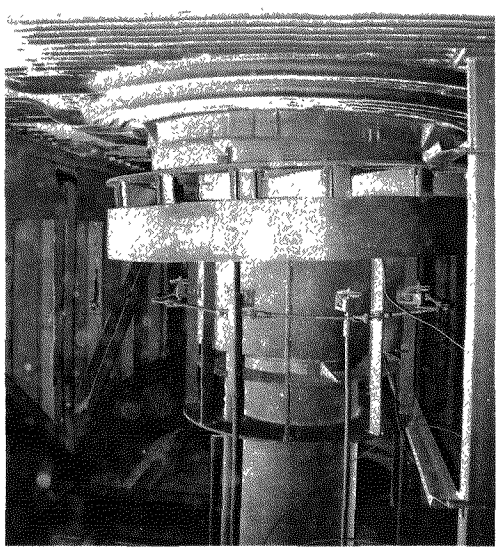


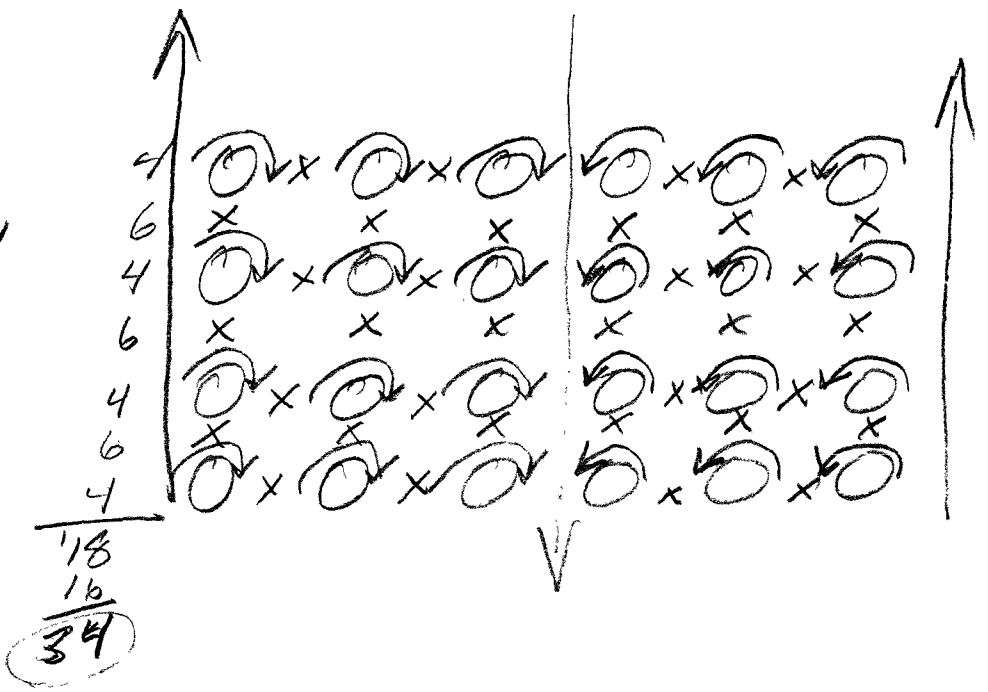






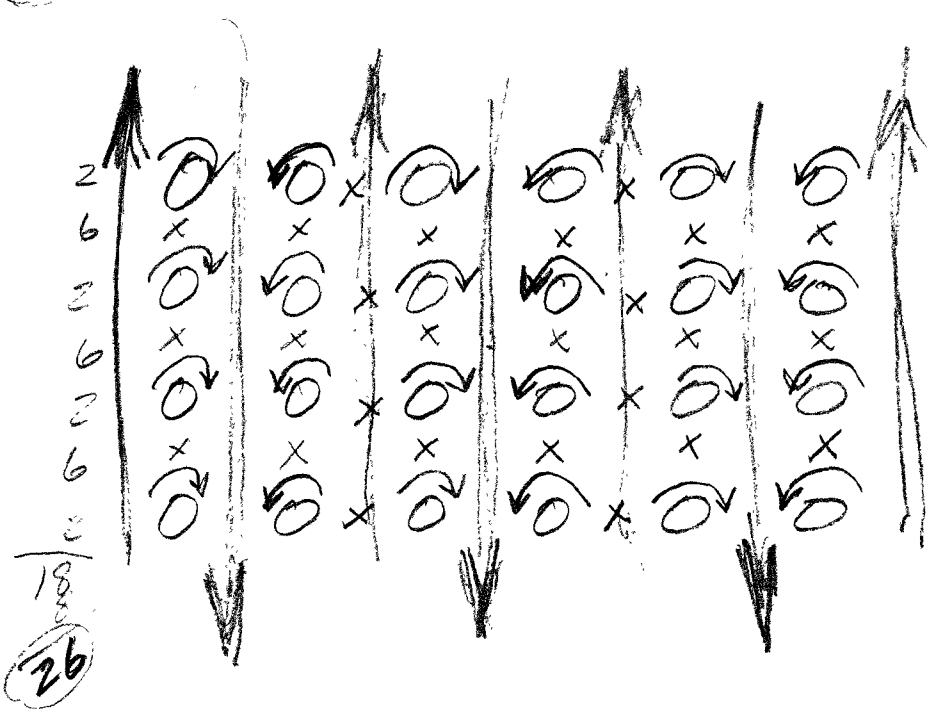


Present

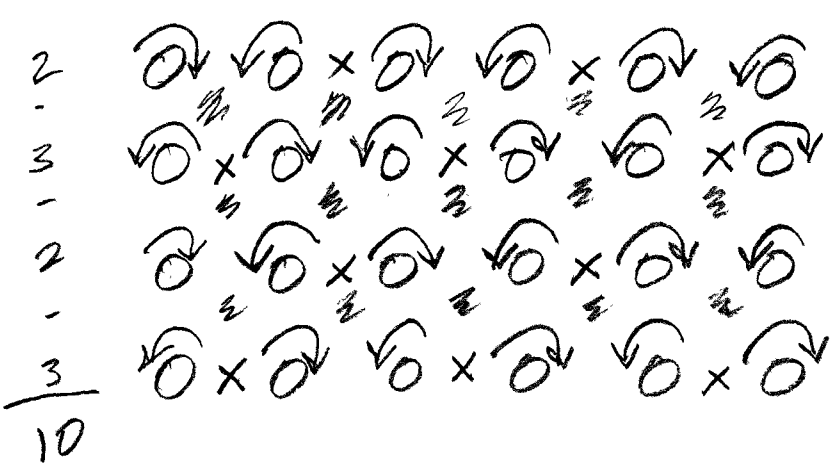


34 Shear.
3 flow

ABT



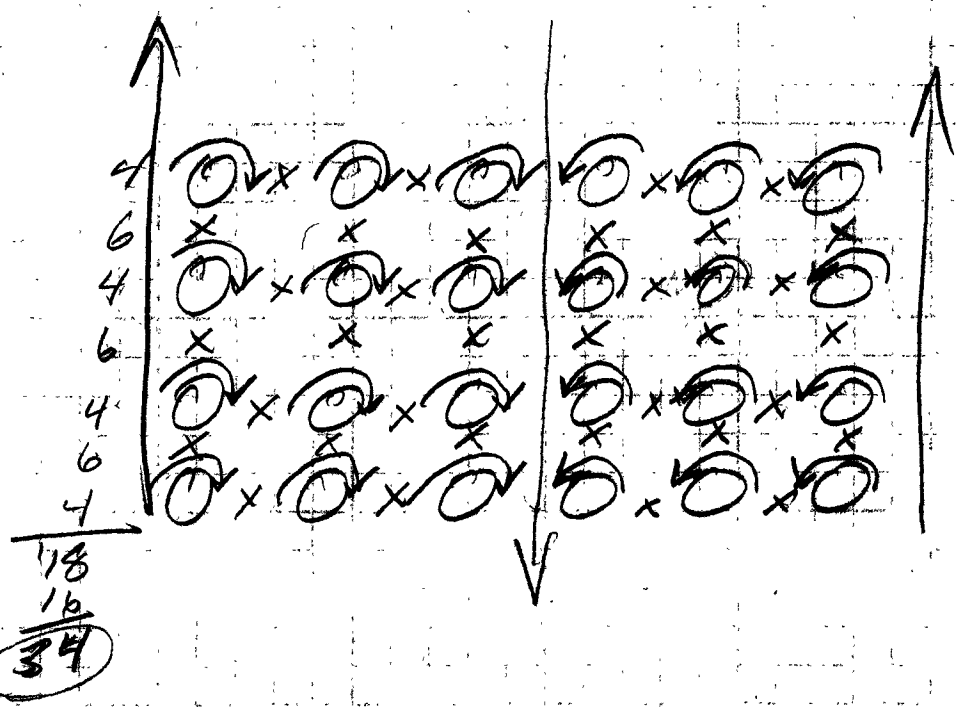
26 Shear
7 flow.



10 Shear
15 Impact

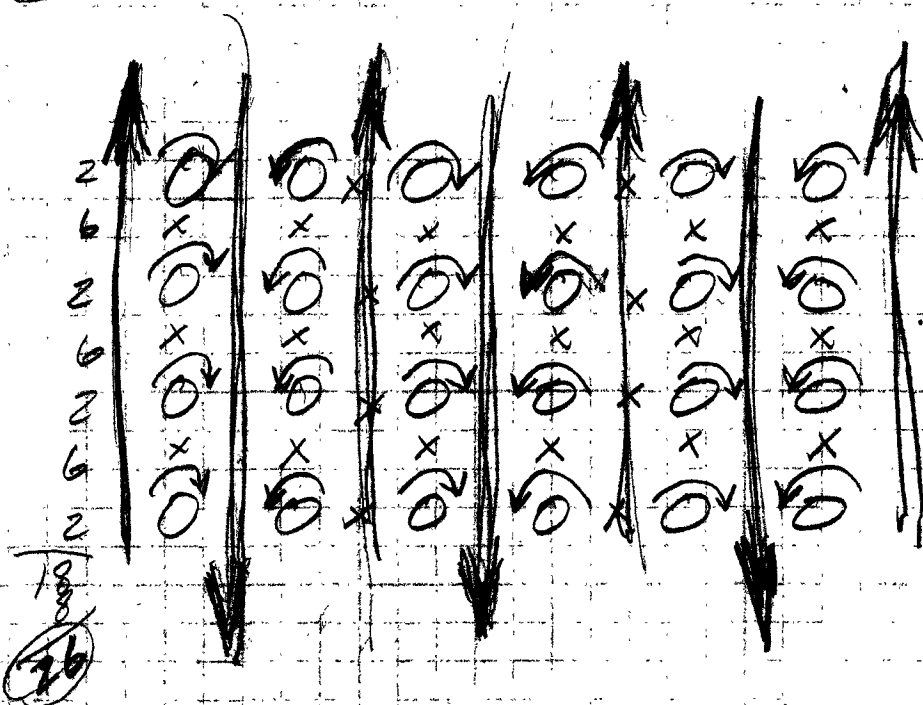
TOPS 35500

Present

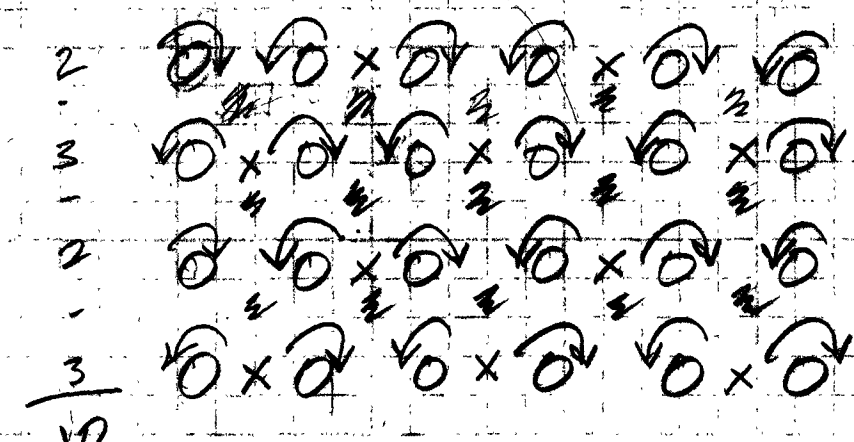


34 Shear.
3 flow

ABT



26 Shear
7 flow.



10 Shear
15 Impact

TOPS 35500

ADVANCED BURNER TECHNOLOGIES
271 Route 202/206
P.O. Box 410
Pluckemin, New Jersey 07978
Phone: 908-470-0470; FAX: 908-470-0479

DRAWING TRANSMITTAL

CONTRACT 04-45606 **Burner Airflow Measuring** **December 15, 2003**

TO: Phil Hailes
FROM: Sal Ferrara

CODE	DRAWING NUMBER	REV	DRAWING TITLE
2, 3	50633	-	Air Monitor "Record Purpose Submittal"

NOTE: Enclosed for your information and use during field installation is the listed Air Monitor Corporation drawing submittal package.

Please advise should you have any questions on these drawings.

Note that the formal report containing results and evaluations of the CFD modeling program is currently being finalized and is expected to be submitted by 12/24/03.

CODE

1 FOR REVIEW
2 FOR ISSUE
3 FOR INFORMATION
4 FOR COMMENT
5 FOR MANUFACTURE
6 OTHER

G:\SHARED DOCUMENTS\CONTRACTS\IPSC A03008\ENGINEERING\TRANSMITTALS\IPSC 12-15-03.doc

AIR MONITOR CORPORATION

P.O. Box 6358
Santa Rosa, CA 95406
707.544.2706 - P
707.526.2825 - F

RECORD PURPOSE SUBMITTAL TRANSMITTAL

To Sal Ferrera
Advanced Burner Technologies
P.O. Box 410
Pluckenmin, NJ 07978

cc Mike Stapf, Sr. (mstapf@ix.netcom.com)

Date	December 12, 2003
AMC Work Order	50633
Purchase Order	A03-008-413
Project	Intermountain - IBAMS
Project Manager	Andrew Chew
Sent Via	sal@advancedburner.com

Enclosed find:

1 Record Purpose Submittals, Rev. 0

This order was placed without a requirement for Submittal approval, and has been released for production.

Changes to the order prompted by review of the Record Purpose Submittals must be immediately communicated to Air Monitor's Application Engineering Department (refer to the Project Manager above) in Santa Rosa, California – 707.544.2706.

Possible charges related to order rework and revision of the previously scheduled ship date may be incurred.

AIR MONITOR CORPORATION

WORK ORDER 50633
PURCHASE ORDER A03-008-413

RECORD PURPOSE SUBMITTAL

PROJECT Intermountain - IBAMS

LOCATION Delta, UT

EQUIPMENT IBAM, VELTRON II in AUTO-purge/SP,
Burner Performance Testing and CFD Modeling

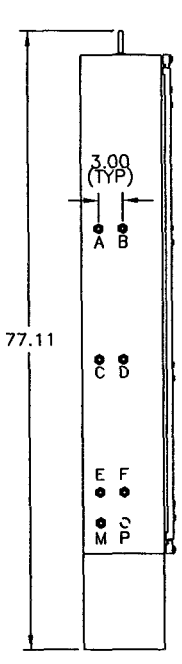
REPRESENTATIVE Stapf Energy Services

CONTACT Mike Stapf, Sr.

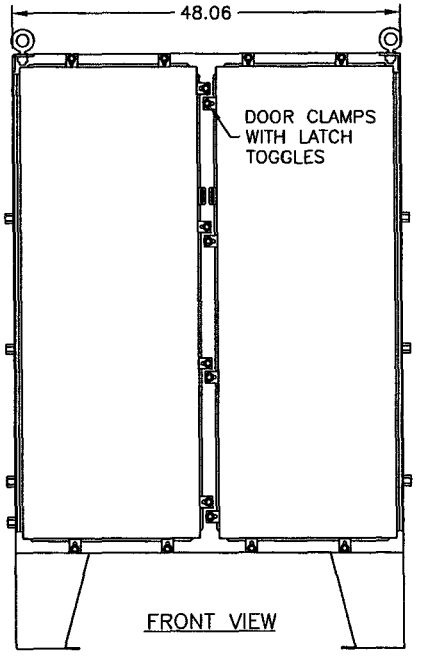
PHONE 610-783-7166

Date	Rev	Project Manager
12/12/03	0	Andrew Chew

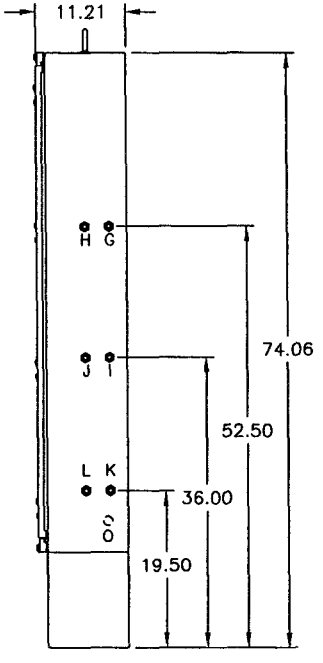
1050 Hopper Avenue Santa Rosa, CA 95403 707.544.2706 - P 707.526.2825 - F



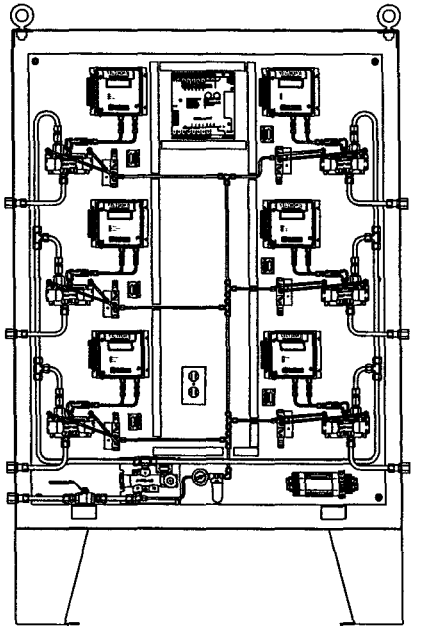
LEFT SIDE



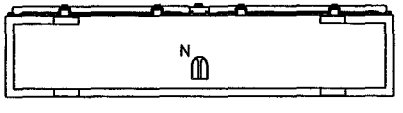
FRONT VIEW



RIGHT SIDE



INSIDE VIEW



BOTTOM OUTSIDE VIEW

CONNECTION CODE:	CONNECTION SIZE:
A. TOTAL (HI) PRESSURE, TO FT-1	1/2" (F)NPT, S.S.
B. STATIC (LO) PRESSURE, TO FT-1	1/2" (F)NPT, S.S.
C. TOTAL (HI) PRESSURE, TO FT-2	1/2" (F)NPT, S.S.
D. STATIC (LO) PRESSURE, TO FT-2	1/2" (F)NPT, S.S.
E. TOTAL (HI) PRESSURE, TO FT-3	1/2" (F)NPT, S.S.
F. STATIC (LO) PRESSURE, TO FT-3	1/2" (F)NPT, S.S.
G. TOTAL (HI) PRESSURE, TO FT-4	1/2" (F)NPT, S.S.
H. STATIC (LO) PRESSURE, TO FT-4	1/2" (F)NPT, S.S.
I. TOTAL (HI) PRESSURE, TO FT-5	1/2" (F)NPT, S.S.
J. STATIC (LO) PRESSURE, TO FT-5	1/2" (F)NPT, S.S.
K. TOTAL (HI) PRESSURE, TO FT-6	1/2" (F)NPT, S.S.
L. STATIC (LO) PRESSURE, TO FT-6	1/2" (F)NPT, S.S.
M. SUPPLY AIR, 80-125 PSIG	1/2" (F)NPT, S.S.
N. CABINET VENT	VENT FITTING
O. ELECTRICAL CONNECTION - 120VAC POWER	3/4" CONDUIT (BY OTHERS)
P. ELECTRICAL CONNECTION - DC SIGNALS	3/4" CONDUIT (BY OTHERS)

NOTES:

1. QUANTITY: 8
2. ENCLOSURE IS NEMA 4, PAINTED STEEL, (HOFFMAN #A-62H48CLP).
3. ALL WETTED TUBING, FITTINGS AND VALVES ARE COPPER OR BRASS. EXTERNAL CONNECTION FITTINGS ARE STAINLESS STEEL.

PROJECT:
INTERMOUNTAIN - IBAMS
DELTA, UT
P.O. #A03-008-413
AMC W.O. #50633

AIR MONITOR CORPORATION
P.O. BOX 6358 SANTA ROSA CA 95406
TELEPHONE (707) 544-2706

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PURGE ENCLOSURE ARRANGEMENT
AUTO-purge III/SP w/VELTRON II

CAD PLOT	FORMAT	DWG NO.	REV
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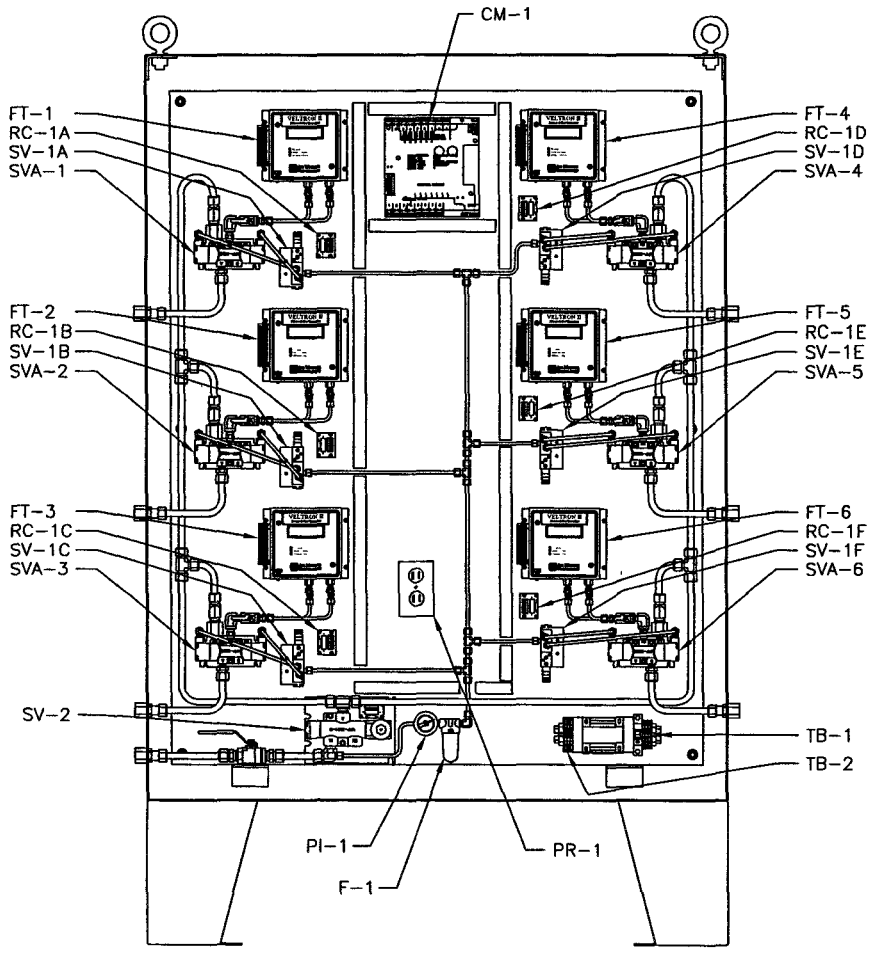
IP7_030994



PURGE ENCLOSURE
(SEE DWG. W50633AA)

PARTS IDENTIFICATION

CM-1	PLC CONTROL MODULE
F-1	SHUTTLE AIR FILTER
FT-1	FLOW/DP TRANSMITTER
FT-2	FLOW/DP TRANSMITTER
FT-3	FLOW/DP TRANSMITTER
FT-4	FLOW/DP TRANSMITTER
FT-5	FLOW/DP TRANSMITTER
FT-6	FLOW/DP TRANSMITTER
PI-1	MAIN SUPPLY AIR PRESSURE GAUGE
RC-1A	SOLENOID RC FILTER CIRCUIT
RC-1B	SOLENOID RC FILTER CIRCUIT
RC-1C	SOLENOID RC FILTER CIRCUIT
RC-1D	SOLENOID RC FILTER CIRCUIT
RC-1E	SOLENOID RC FILTER CIRCUIT
RC-1F	SOLENOID RC FILTER CIRCUIT
SV-1A	PILOT AIR SOLENOID VALVE
SV-1B	PILOT AIR SOLENOID VALVE
SV-1C	PILOT AIR SOLENOID VALVE
SV-1D	PILOT AIR SOLENOID VALVE
SV-1E	PILOT AIR SOLENOID VALVE
SV-1F	PILOT AIR SOLENOID VALVE
SV-2	MAIN SUPPLY AIR SOLENOID VALVE
SVA-1	SHUTTLE VALVE ASSEMBLY
SVA-2	SHUTTLE VALVE ASSEMBLY
SVA-3	SHUTTLE VALVE ASSEMBLY
SVA-4	SHUTTLE VALVE ASSEMBLY
SVA-5	SHUTTLE VALVE ASSEMBLY
SVA-6	SHUTTLE VALVE ASSEMBLY
T-1	120VAC/24VAC TRANSFORMER
TB-1	120VAC TERMINAL BLOCK
TB-2	24VAC TERMINAL BLOCK
PR-1	POWER RECEPTACLE

NOTES:
1. TYPICAL FOR 8 ENCLOSURES.

PROJECT:
INTERMOUNTAIN - IBAMS
DELTA, UT
P.O. #A03-008-413
AMC W.O. #50633

AIR MONITOR CORPORATION
P.O. BOX 6358 SANTA ROSA CA 95406
TELEPHONE (707) 544-2706

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PARTS IDENTIFICATION
AUTO-purge III/SP w/VELTRON II

CAD PLOT	FORMAT	DWG NO.	REV
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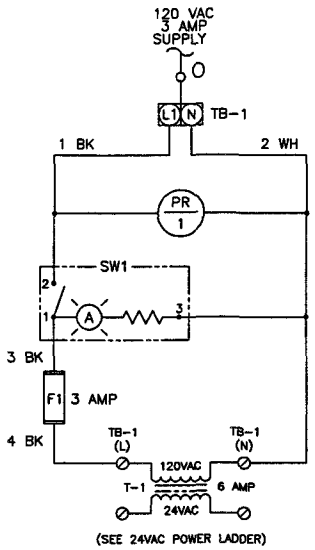
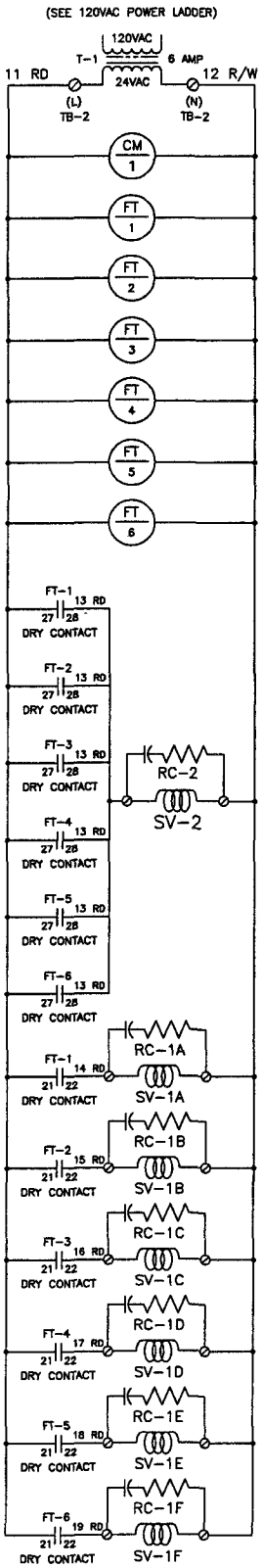
IP7_030996



120VAC POWER LADDER



24VAC POWER LADDER

WIRING NUMBERS/COLORS

1–10	120VAC POWER
11–20	24VAC POWER
21–40	24VDC POWER
41–60	24VDC SIGNALS
61–80	DRY CONTACTS
BLACK	120VAC, LINE
WHITE	120VAC, NEUTRAL
RED	24VAC, LINE
RED/WHITE	24VAC, NEUTRAL
BLUE	24VDC (+)
BLUE/WHITE	24VDC (–)
ORANGE	24VDC SIGNAL (+)
BLUE/WHITE	24VDC SIGNAL (–)
YELLOW	DRY CONTACTS

NOTES:
1. TYPICAL FOR 8 ENCLOSURES.

PROJECT:
INTERMOUNTAIN – IBAMS
DELTA, UT
P.O. #A03–008–413
AMC W.O. #50633

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POWER LADDER DIAGRAM
AUTO–purge III/SP w/VELTRON II

CAD PLOT	FORMAT	DWG NO	REV
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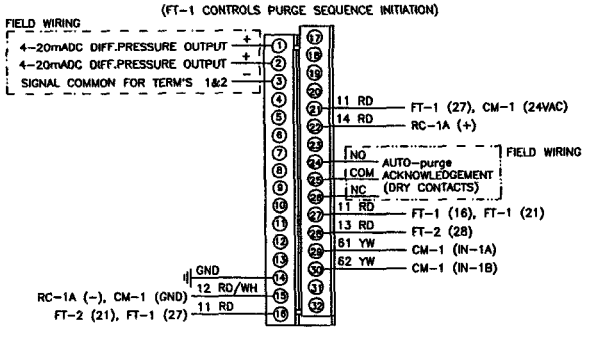
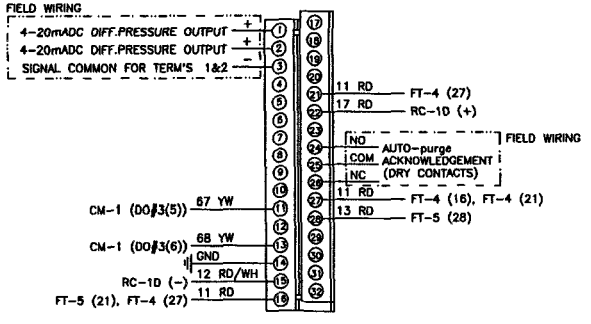
SCALE FACTOR: 6.00	SCALE: 1:6.00	DO NOT SCALE DRAWING	

FT-1 WIRING TERMINALS

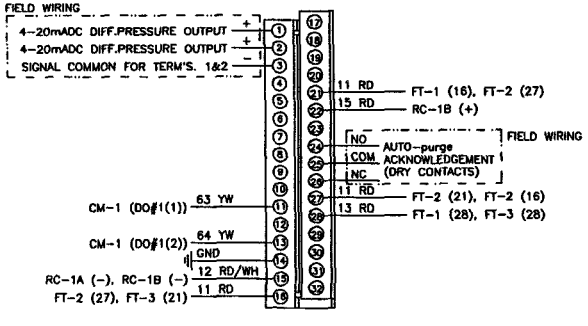
(FT-1 CONTROLS PURGE SEQUENCE INITIATION)



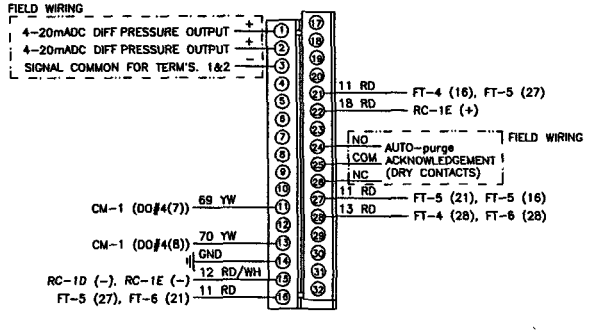
FT-4 WIRING TERMINALS



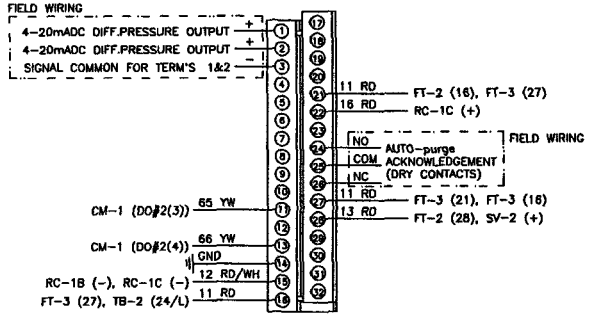
FT-2 WIRING TERMINALS



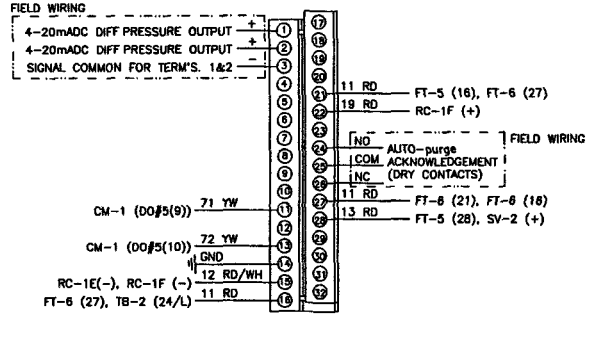
FT-5 WIRING TERMINALS



FT-3 WIRING TERMINALS



FT-6 WIRING TERMINALS



NOTES:

1. TYPICAL FOR 8 ENCLOSURES.

PROJECT:

INTERMOUNTATIN – IBAMS
DELTA, UT
P.O. #A03-008-413
AMC W.O. #50633

AIR MONITOR CORPORATION
P.O. BOX 6358 SANTA ROSA CA 95406
TELEPHONE (707) 544-2706

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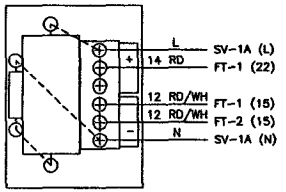
WIRING DETAILS (1 OF 2)
AUTO-purge III/SP w/VELTRON II

CAD PLOT	FORMAT	DWG NO.	REV
12/09/03 15:34:30	B	W50633AD	0

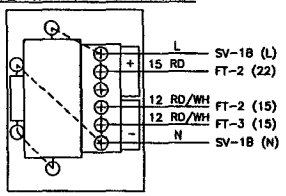
SCALE FACTOR: 2.00 | SCALE: 1:2.00 | DO NOT SCALE DRAWING

IP7_030997

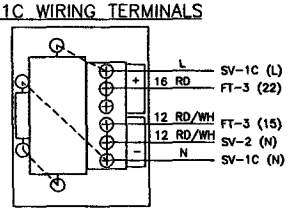
RC-1A WIRING TERMINALS

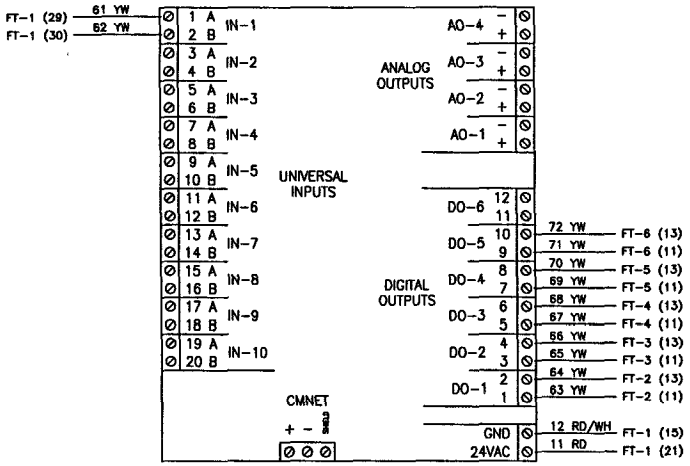


RC-1B WIRING TERMINALS



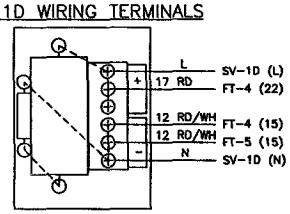
RC-1C WIRING TERMINALS



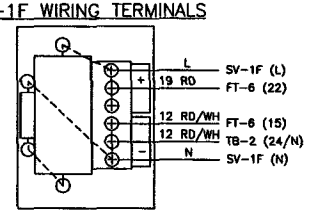


CM-1 WIRING TERMINALS

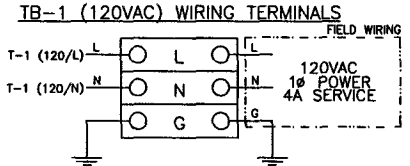
RC-1D WIRING TERMINALS



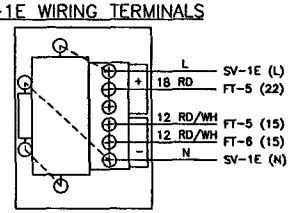
RC-1F WIRING TERMINALS



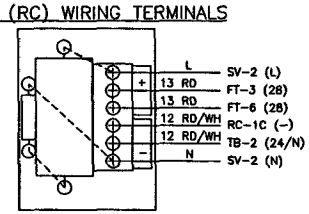
TB-1 (120VAC) WIRING TERMINALS



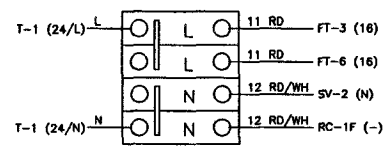
RC-1E WIRING TERMINALS



SV-2 (RC) WIRING TERMINALS



TB-2 (24VAC) WIRING TERMINALS



NOTES:
1. TYPICAL FOR 8 ENCLOSURES.

PROJECT:
INTERMOUNTAIN - IBAMS
DELTA, UT
P.O. #A03-008-413
AMC W.O. #50633

AIR MONITOR CORPORATION
P.O BOX 6358 SANTA ROSA CA 95406
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WIRING DETAILS (2 OF 2)
AUTO-purge III/SP w/VELTRON II

CAD PLOT	FORMAT	DWG NO	REV
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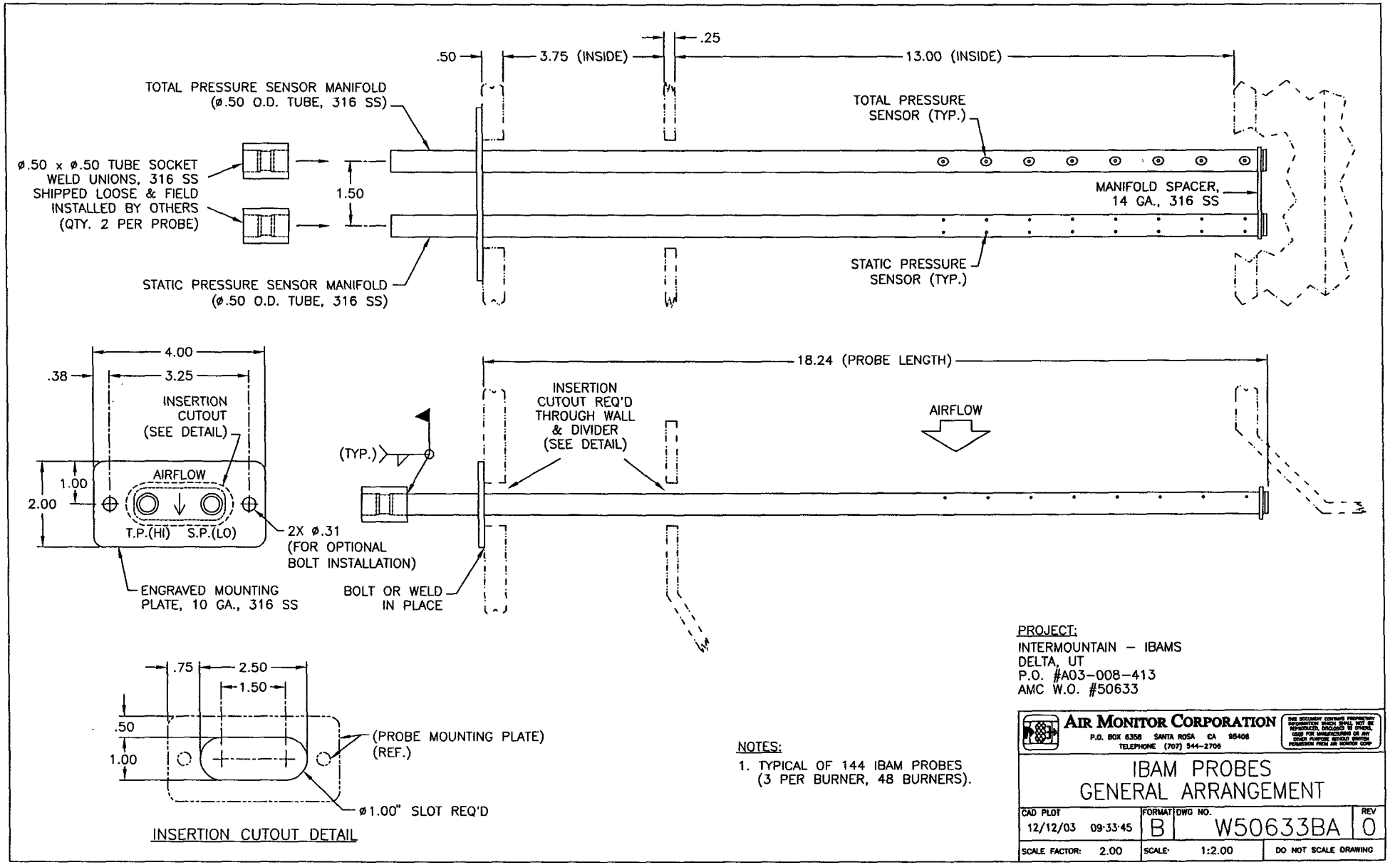
SCALE FACTOR: 2.00 | SCALE: 1:2.00 | DO NOT SCALE DRAWING

IP7_030998

IP7_030999



PROJECT:
INTERMOUNTAIN – IBAMS
DELTA, UT
P.O. #A03-008-413
AMC W.O. #50633

NOTES:

1. TYPICAL OF 144 IBAM PROBES (3 PER BURNER, 48 BURNERS).

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IBAM PROBES
GENERAL ARRANGEMENT

CAD PLOT	FORMAT	DWG NO.	REV
12/12/03 09:33:45	B	W50633BA	0

SCALE FACTOR: 2.00 | SCALE: 1:2.00 | DO NOT SCALE DRAWING

IP7_031000

REV	DESCRIPTION	DATE	DWN	APV
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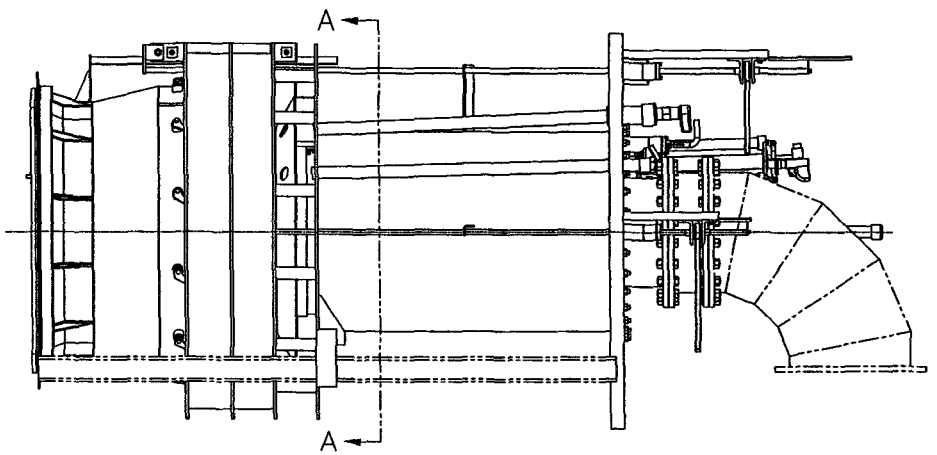
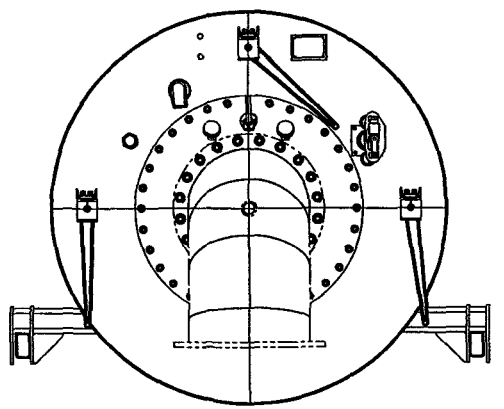
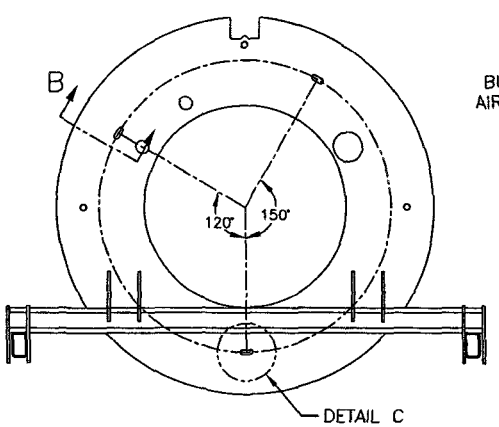


BURNER SIDE VIEW



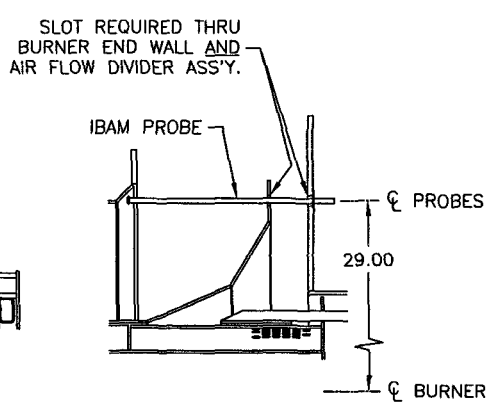
BURNER END VIEW

CCW SHOWN, CW IS OPPOSITE HAND



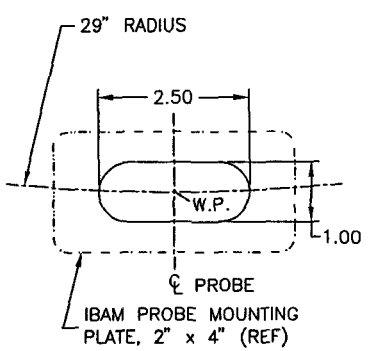
SECTION A–A

CCW SHOWN, CW IS OPPOSITE HAND



SECTION B–B

PARTIAL SECTION @ PROBE LOCATION



DETAIL C

PROBE MOUNTING SLOT
TYPICAL 3 LOCATIONS

NOTES:

1. TYPICAL OF 48 BURNERS

PROJECT:

INTERMOUNTAIN – IBAMS
DELTA, UT
P.O. #A03–008–413
AMC W.O. #50633

AIR MONITOR CORPORATION
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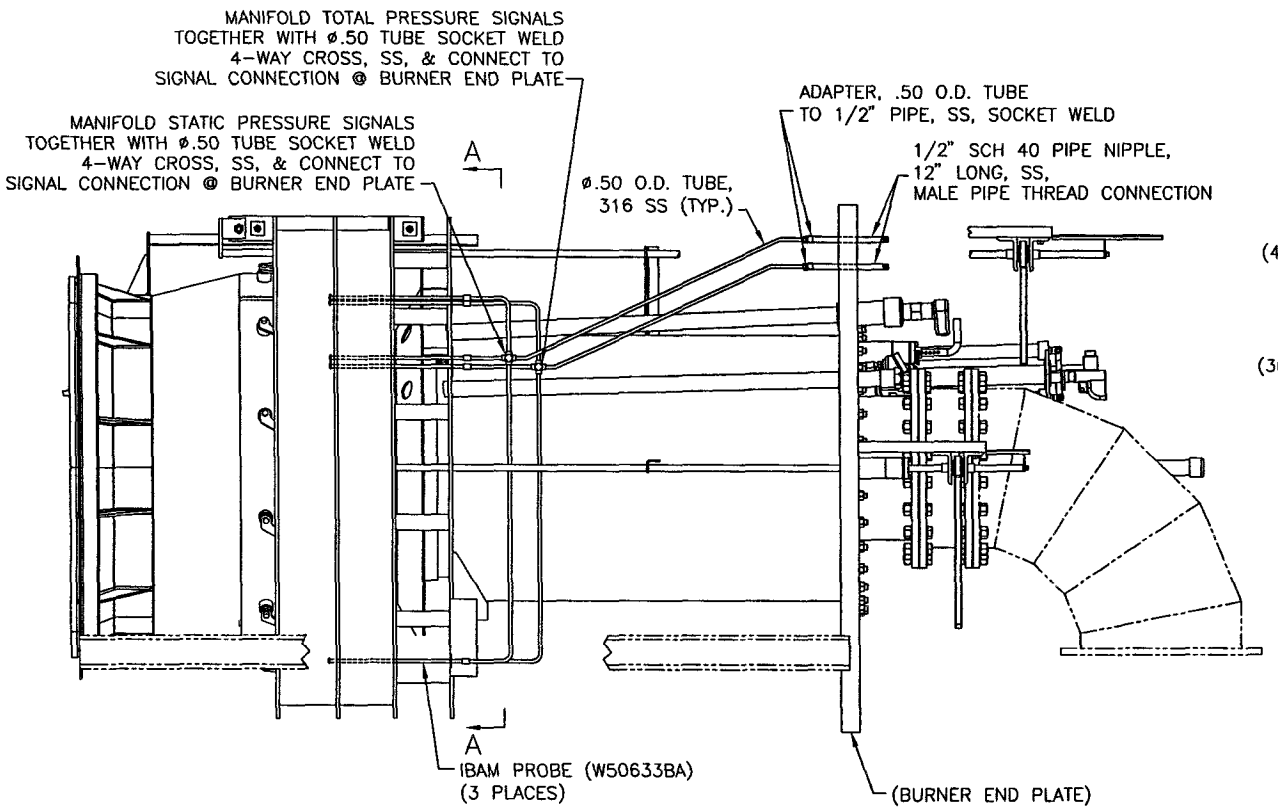
IBAM PROBES
INSTALLATION

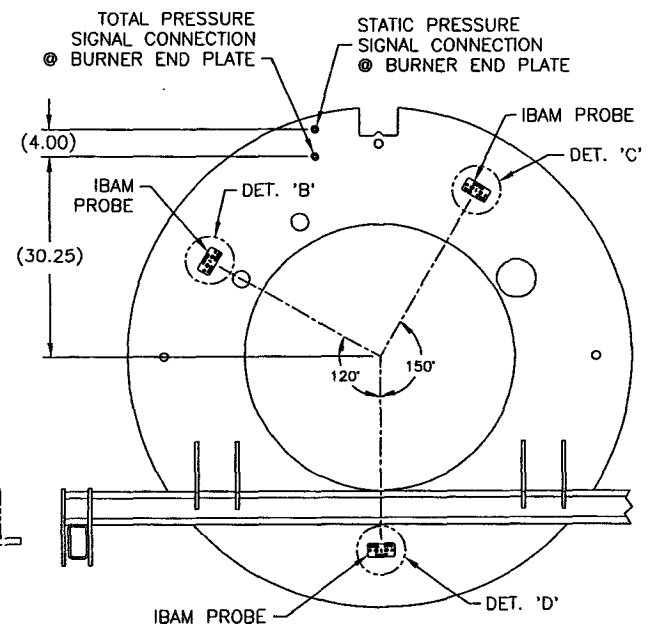
CAD PLOT	FORMAT	DWG NO.	REV
12/12/03 09:49:13	B	W50633BB	1

SCALE FACTOR: 24.00 | SCALE: 1:24.00 | DO NOT SCALE DRAWING

IP7_031001

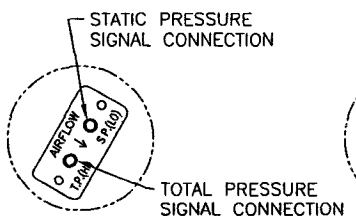


BURNER SIDE VIEW

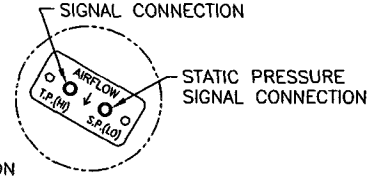


SECTION A–A

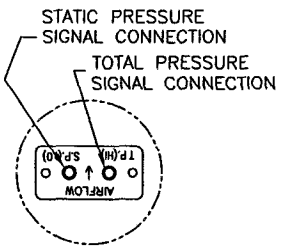
PARTS LOCATION
(SIGNAL MANIFOLDING SHOWN IN SIDE VIEW)
CCW SHOWN, CW IS OPPOSITE HAND



DETAIL B



DETAIL C



DETAIL D

NOTES:

1. TYPICAL OF 48 BURNERS

PROJECT:

INTERMOUNTAIN – IBAMS
DELTA, UT
P.O. #A03-008-413
AMC W.O. #50633

AIR MONITOR CORPORATION
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IBAM PROBES
SIGNAL MANIFOLDING

CAD PLOT		FORMAT	DWG NO.	REV
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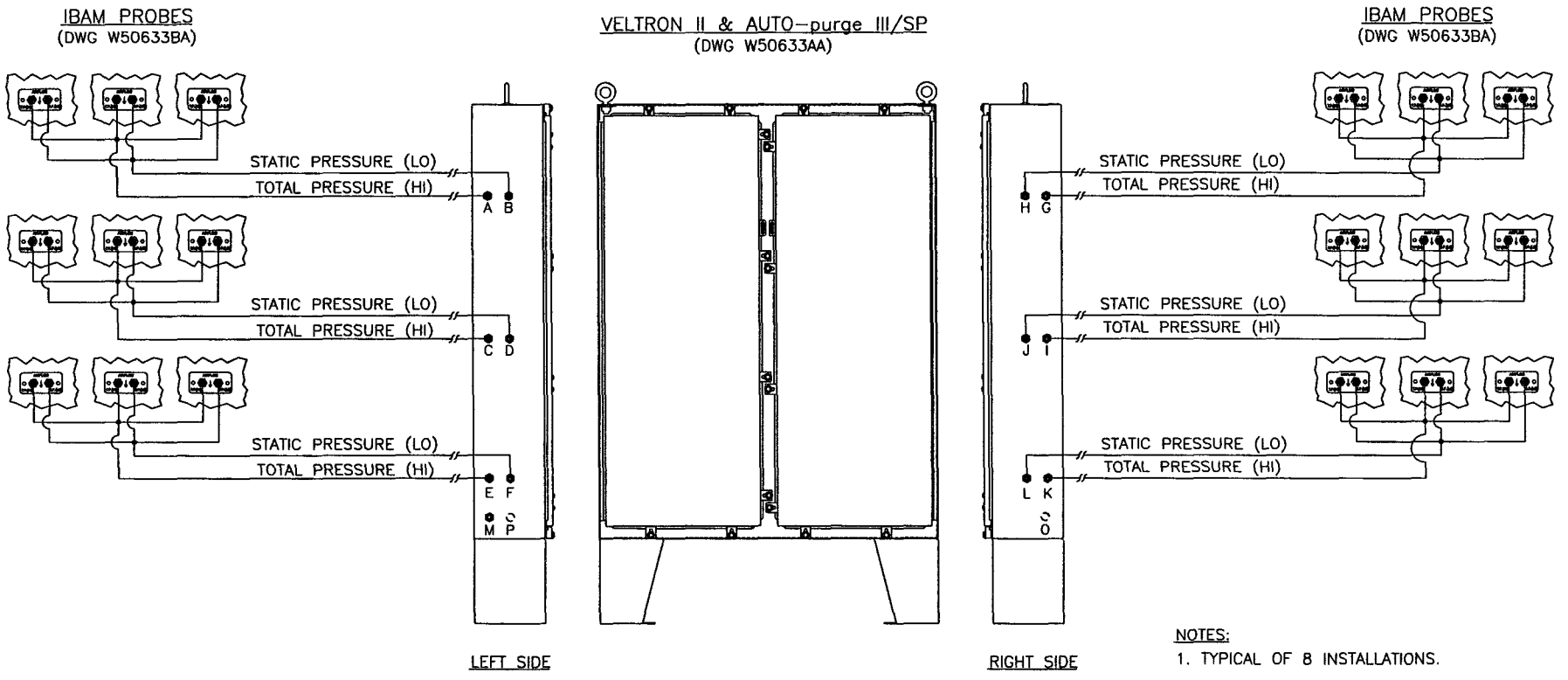
SCALE FACTOR: 18.00		SCALE: 1:18.00		DO NOT SCALE DRAWING



NOTES:

1. TYPICAL OF 8 INSTALLATIONS.

PROJECT:

INTERMOUNTAIN – IBAMS
DELTA, UT
P.O. #A03-008-413
AMC W.O. #50633

LEGEND:

——————— SIGNAL TUBING (BY OTHERS)

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SYSTEM TUBING DIAGRAM

CAD PLOT	FORMAT	DWG NO.	REV
12/12/03 09:17:21	B	W50633CA	0
SCALE FACTOR: 15.00	SCALE: 1:15.00	DO NOT SCALE DRAWING	

ABT INTERMOUNTAIN IBAM TESTING

Air Monitor Work Order Number: 50633
Maximum secondary airflow per burner is 161,000 LB/HR (88,297 acfm, 35,716 scfm)
Average operating air temperature: 645° F
Normal operating static pressure of the burner is 3 in. w.c.

The outer volume damper will be tested at 4.8", 10.4" and 16" open.
The inner volume damper positions will be tested at 1" and 5" open.
The swirl vane positions will be tested at 30°, 45° and 60°.
Testing at three fan settings (flow rates) 5, 7 & 10VDC will be performed. Fan capacity @10VDC = 36000 acfm.

WIND TUNNEL TEST MATRIX

Test #	Outer Damper Position	Inner Damper Position	Swirl Vane Position	VFD Setting
1	4.8"	1"	30°	5 VDC
2	4.8"	1"	30°	7 VDC
3	4.8"	1"	30°	10 VDC
4	10.4"	1"	30°	10 VDC
5	10.4"	1"	30°	7 VDC
6	10.4"	1"	30°	5 VDC
7	16"	1"	30°	5 VDC
8	16"	1"	30°	7 VDC
9	16"	1"	30°	10 VDC
10	16"	5"	30°	10 VDC
11	16"	5"	30°	7 VDC
12	16"	5"	30°	5 VDC
13	10.4"	5"	30°	5 VDC
14	10.4"	5"	30°	7 VDC
15	10.4"	5"	30°	10 VDC
16	4.8"	5"	30°	10 VDC
17	4.8"	5"	30°	7 VDC
18	4.8"	5"	30°	5 VDC
19	4 8"	5"	45°	5 VDC
20	4.8"	5"	45°	7 VDC
21	4.8"	5"	45°	10 VDC
22	10.4"	5"	45°	10 VDC
23	10.4"	5"	45°	7 VDC
24	10.4"	5"	45°	5 VDC
25	16"	5"	45°	5 VDC
26	16"	5"	45°	7 VDC
27	16"	5"	45°	10 VDC
28	16"	1"	45°	10 VDC
29	16"	1"	45°	7 VDC
30	16"	1"	45°	5 VDC
31	10.4"	1"	45°	5 VDC
32	10.4"	1"	45°	7 VDC
33	10.4"	1"	45°	10 VDC
34	4.8"	1"	45°	10 VDC
35	4.8"	1"	45°	7 VDC
36	4.8"	1"	45°	5 VDC
37	4.8"	1"	60°	5 VDC
38	4.8"	1"	60°	7 VDC
39	4.8"	1"	60°	10 VDC
40	10.4"	1"	60°	10 VDC
41	10.4"	1"	60°	7 VDC
42	10.4"	1"	60°	5 VDC
43	16"	1"	60°	5 VDC
44	16"	1"	60°	7 VDC
45	16"	1"	60°	10 VDC
46	16"	5"	60°	10 VDC
47	16"	5"	60°	7 VDC
48	16"	5"	60°	5 VDC
49	10.4"	5"	60°	5 VDC
50	10.4"	5"	60°	7 VDC
51	10.4"	5"	60°	10 VDC
52	4.8"	5"	60°	10 VDC
53	4.8"	5"	60°	7 VDC
54	4.8"	5"	60°	5 VDC

ABT INTERMOUNTAIN IBAM TESTING

Air Monitor Work Order Number: 50633
The outer volume damper will be tested at 4.8" and 16" open.
The inner volume damper positions will be tested at 1" & 5" open.
The swirl vane position backpressure will be simulated for a single 45° position.
Testing at three flow rates: 160,000 lb/hr, 110,000 lb/hr & 70,000 lb/hr.

CFD MODELING TEST MATRIX

Test #	Outer Damper Position	Inner Damper Position	Flow Rate	Temp. °F	Pressure In. W.C.	Barometer In. Hg
1	4.8"	1"	110,000 lbs/hr	85°	3"	29.921"
2	16"	1"	110,000 lbs/hr	85°	3"	29.921"
3	16"	1"	70,000 lbs/hr	645°	3"	25.105"
4	4.8"	1"	70,000 lbs/hr	645°	3"	25.105"
5	4.8"	1"	161,000 lbs/hr	645°	3"	25.105"
6	16"	1"	161,000 lbs/hr	645°	3"	25.105"
7	16"	5"	161,000 lbs/hr	645°	3"	25.105"
8	4.8"	5"	161,000 lbs/hr	645°	3"	25 105"
9	4.8"	5"	70,000 lbs/hr	645°	3"	25.105"
10	16"	5"	70,000 lbs/hr	645°	3"	25.105"
11	16"	5"	110,000 lbs/hr	85°	3"	29.921"
12	4.8"	5"	110,000 lbs/hr	85°	3"	29.921"

AUTO-purge III
INSTALLATION GUIDE

Air Requirement.

80 to 125 psig at 100 CFM, oil and dirt free. 1 to 24 purge cycles per day, with a field selectable duration between 30 and 120 seconds during which compressed air is released.

Line Size from AUTO-purge Panel to Flow Measuring Station or Probes.

Distance from AUTO-purge panel to flow measuring station air probe.	Tube Size.
< 25'	1/2" S.S. tube
25' - 50'	3/4" S.S. tube
> 50'	1.0" S.S. tube

Accumulator Tank (strongly recommended).

Requires coalescing filter, pressure regulator, and check valve at the tank inlet.

120 gallons	-	All CA stations.
120 gallons	-	Multiple VOLU-probes having a combined length greater than 10'.
80 gallons	-	One or more VOLU-probes having a combined length less than 10'.

Line from Accumulator Tank to AUTO-purge Panel.

25' maximum length, ½" pipe (minimum). Recommend locating accumulator tank as close as possible to AUTO-purge panel.

Electrical Power Requirement.

None when used with an Air Monitor transmitter. (NOTE: This adds 36VA to the transmitter's power requirement.)
24VAC, 36VA when not initiated by an Air Monitor transmitter.
120VAC, 10 amp when an optional enclosure heater is installed.

Ambient Temperature.

40°F-140°F. For ranges above or below this ambient temperature, use of panel heater and/or cooler is required.

Purge Frequency.

Once/day minimum, once/hour maximum.

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AIR MONITOR CORPORATION

SUBMITTAL SHEET

VELTRON II

ULTRA-LOW RANGE DIFFERENTIAL PRESSURE/ FLOW TRANSMITTER

OPTIONS
- ☐ Alarms or ☒ AUTO-purge Management
- ☐ Auxiliary Output
- ☐ Terminal Cover/Conduit Connection

Special Function
- ☐ % Deviation
- ☐ Summed Flow
- ☐ Averaged Flow
- ☐ Differential Flow
- ☐ Low Select
- ☐ High Select

Power
- ☐ 24VAC
- ☐ 20-40VDC
- ☒ 120VAC (via external transformer)

Certification
- ☐ Standard
- ☐ NIST Traceable

Display
- ☒ 2x20 LCD (Std)
- ☐ 4x20 LCD

PERFORMANCE SPECIFICATIONS

Accuracy.
±0.1% of Natural Span, including non-linearity, hysteresis, deadband, and non-repeatability.

Stability.
±0.5% of Natural Span for one year.

Temperature Effect.
Zero. None; corrected by AUTO-zero.
Span. 0.015% of Full Span/°F.

Mounting Position Effect.
None; corrected by AUTO-zero.

Transducer Response Time.
0.5 seconds to reach 98% of a step change.

Power Consumption.
Standard: 18VA at 24VAC; 13VA at 24VDC; 36VA at 120VAC.

With AUTO-purge Management: 54VA at 24VAC; 48VA at 24VDC; 108VA at 120VAC

FUNCTIONAL SPECIFICATIONS

Digital Outputs.
Dual form C dry contacts rated for 3 Amps at 24VAC/VDC for optional Hi/Lo alarm. Dual Form A dry contacts rated for 3 amps at 24VAC/VDC for AUTO-purge activation and acknowledgment.

Digital Inputs.
Dry contact for AUTO-purge external start command.

Analog Outputs.
Dual transmitter outputs are individually configurable via jumper for 0-5VDC, 0-10VDC, or 4-20mADC. Two additional outputs are optionally available.

Analog Inputs.
A single input is field configurable via jumper for 0-5VDC, 0-10VDC, or 4-20mADC. For use with optional special function.

AUTO-purge Management.
AUTO-purge cycle is initiated via an external dry contact input, or via an internal timer with field selectable frequencies of 1 to 24 hours, in 1 hour increments. An SPDT dry contact controls the AUTO-purge System; a second dry contact provides remote purge activation acknowledgment.

Power Supply.
Standard 24VAC (20-28VAC) or 24VDC (20-40VDC), with automatic selection. Optional 120VAC (100-132VAC), via external transformer.

Low Pass Filtration.
Response time to reach 98% of a step change is adjustable from 2.0 to 250.0 seconds.

Automatic Zeroing.
Accuracy. Within 0.1% of calibrated span.
Frequency. Every 1 to 24 hours on 1 hour intervals.

Overpressure and Static Pressure Limit.
25 psig.

Circuit Protection.
Power input is isolated, fused and reverse polarity protected.

Span and Zero Adjustment.
Digital, via internally located push-buttons.

Displays.
Standard 2 line x 20 character LCD provides one line of data display. Optional 4 line x 20 character LCD provides up to 4 lines of data display.

LED's indicate CPU activated, AUTO-zero in progress, AUTO-zero over-ranged, AUTO-purge in progress, and auxiliary alarm "on" status.

Humidity Limits.
0-95% RH, non-condensing.

Temperature Limits.
–20°F to 180°F Storage.
+40°F to 140°F Operating.

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AIR MONITOR CORPORATION

6.88.2

VELTRON II

ULTRA-LOW RANGE DIFFERENTIAL PRESSURE/ FLOW TRANSMITTER

PHYSICAL SPECIFICATIONS

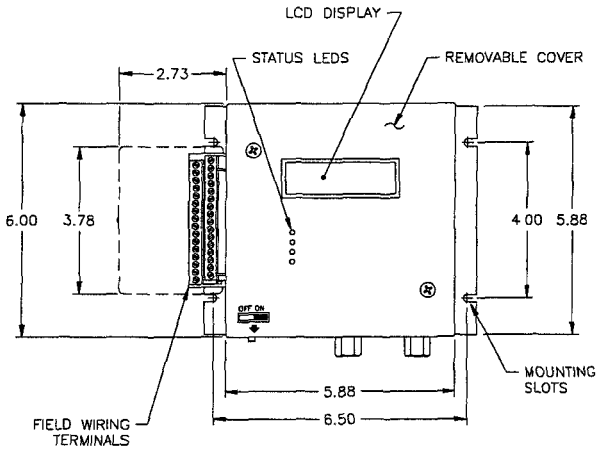
Signal Connections.
High and low pressure, 1/8" FPT.

Electrical Connections.
External terminal strip with plug-in connectors. Optional terminal strip enclosure with dual 3/4" conduit connections.

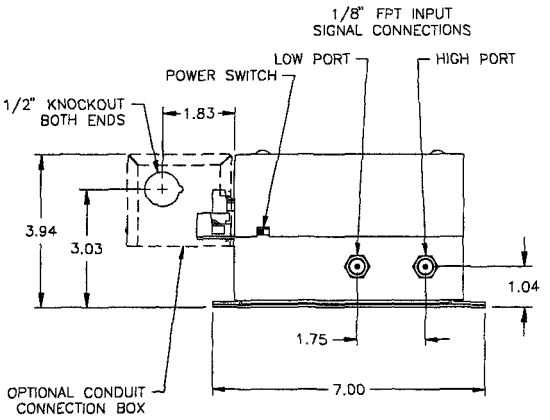
Enclosure.
NEMA 1 aluminum enclosure.

Weight.
4.1 lbs.

DIMENSIONAL SPECIFICATIONS

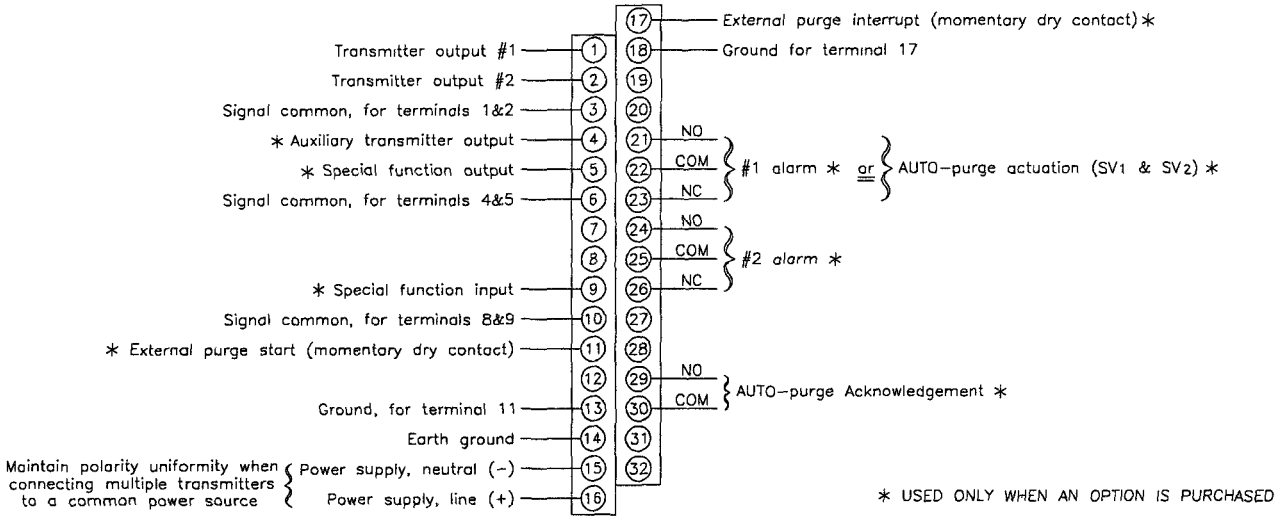


FRONT VIEW



BOTTOM VIEW

WIRING DIAGRAM



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AIR MONITOR CORPORATION

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AIR MONITOR CORPORATION

TRANSMITTER SPAN/MASS FLOW CALCULATIONS

PROJECT: **ABT/INTERMOUNTAIN POWER BURNER**
WORK ORDER: **50633** *REV:* **0**
TAG(S): **PRELIMINARY SPAN DATA CALCULATION ONLY**

Given Information:

Fluid:	AIR	
Standard Temperature (T_{std}):	68	(deg. F)
Standard Barometric Pressure (P_{std}):	29.921	(in. Hg)
Air Temperature (T):	645	(deg. F)
Stack/Duct Pressure (P_g):	3.00	(in. w.c.)
Actual Barometric Pressure (P_{bar}):	25.105	(in. Hg)
Air Density at Standard Conditions, DRY:	0.07513	(lbs/ft^3)
Duct Shape:	CIRC	
Duct Diameter:	62.805	(in.)

% H_2O (by volume): 0.00 (%, by volume)

Maximum Flow: 161,000 (lb/hr)
Wet (Wet/Dry)

Square Root Extraction? (Yes/No): No

Output: 4-20 mADC

Calculations:

Duct Area (A_s):	21.514	(ft^2)
Maximum Actual Velocity:	4,104	(AFPM)
Absolute Duct Pressure (P_s):	25.326	(in. Hg)
Dry Mole Fraction of Duct (Mfd):	1.000	
Dry Molecular Wt. Of Air (Md):	28.965	(lb/lb-mole)
Wet Molecular Wt. Of Air (Ms):	28.965	(lb/lb-mole)
Air Density at Standard Conditions, WET:	0.07513	(lbs/ft^3)
Air Density at Actual Conditions, WET:	0.03039	(lbs/ft^3)

% DP (%)	Diff. Press. (in. w.c.)	Output (mADC)	Actual Flow (ACFM)	Std.Flow/Dry (SCFM)	Std.Flow/Wet (SCFM)	MassFlow/Dry (Lbs/Hr)	MassFlow/Wet (Lbs/Hr)
0	0.0000	4.00	0	0	0	0	0
10	0.0425	5.60	27,922	11,294	11,294	50,913	50,913
20	0.0850	7.20	39,487	15,973	15,973	72,001	72,001
30	0.1275	8.80	48,362	19,562	19,562	88,183	88,183
40	0.1700	10.40	55,844	22,589	22,589	101,825	101,825
50	0.2125	12.00	62,435	25,255	25,255	113,844	113,844
60	0.2550	13.60	68,394	27,665	27,665	124,710	124,710
70	0.2975	15.20	73,874	29,882	29,882	134,702	134,702
80	0.3400	16.80	78,975	31,945	31,945	144,003	144,003
90	0.3825	18.40	83,765	33,883	33,883	152,738	152,738
100	0.4250	20.00	88,297	35,716	35,716	161,000	161,000

Transmitter:	VELTRON II	Power (voltage/type):	24VAC
Flow Element:	IBAM	Power Configuration:	4-Wire
Transmitter Maximum Range:	0.00 - 1.00 IN w.c.	Square Root:	OFF

Display Line #1:	0.00 - 1.00 IN w.c.	(DIFFERENTIAL PRESSURE)
Display Line #2:		(N/A)
Display Line #3:		(N/A)
Display Line #4:		(N/A)

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Air Monitor Corporation

CONTROL MODULE

FEATURES

- Separate, quick change, plug-in terminal strip for input and output wiring.
- On/Off power switch on the module.
- Individual On/Off/Auto switches for relay outputs.
- Field configurable inputs for 0-5VDC, 4-20mADC, or dry contacts.
- Factory configured, programmed, and tested. Reprogrammable in the field or by remote phone access (requires Communications Module and modem).

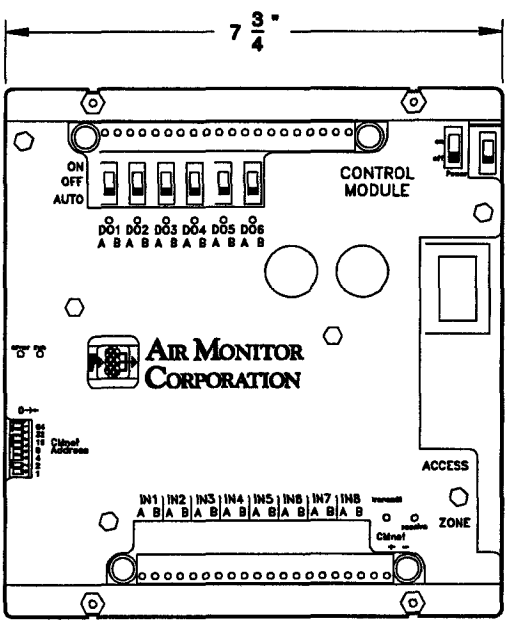
PERFORMANCE SPECIFICATIONS

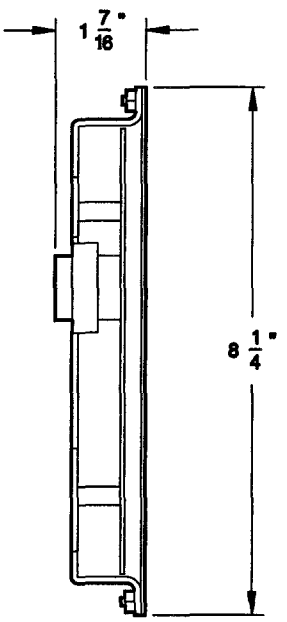
Input.	0.1% Resolution.	**Scan Time.**	0.25 second scan cycle time for all inputs and outputs.
Output.	0.4% Resolution.	**Microprocessor.**	Motorola MC68HC11.

FUNCTIONAL SPECIFICATIONS

Outputs.	Three analog 0-10VDC. Six SPDT relay outputs (Form A), 3 amps maximum @ 24VAC/VDC.
Inputs.	Eight universal inputs (0-5VDC, 4-20mADC, or dry contact).
Communications.	RS485 port programmable for 9600 to 38.4 kbps.
Memory.	Non-volatile read/write.
Power Supply.	24VAC, 50-60 Hz. 20VA maximum. Lithium battery provides 10,000 hours of data storage during power outages.
Circuit Protection.	Surge protection on input power. Optical isolation on RS485 communication line. Arc suppression on relay outputs.
Indication.	LED indicators for status of outputs, power, and communication.
Temperature Limit.	-20°F to 180°F storage. 40°F to 150°F operating.

DIMENSIONAL SPECIFICATIONS





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AIR MONITOR CORPORATION

SUB-A002, Rev. 2 (10/94)

WARRANTY

PROCESS / POWER

PRODUCTS COVERED

FAN-E/SS	VOLU-probe/SS	VOLU-probe/VS-SS	CA Stations
LO-flo/SS	VOLU-probe/SM	VOLU-probe/FI-SS	IBAMS
SAP	SOAP	STAT-probe/1SS	STACK-probe

WARRANTY

Air Monitor Corporation (hereinafter referred to as "Seller") warrants that at the time of shipment, products sold pursuant to this contract will be free from defects in materials and workmanship, and will conform to the specifications furnished or approved in writing by Seller. No warranty is given that delivered products will conform to catalog sheets, data sheets, and the like, which are subject to change without notice.

Seller will repair or replace, at its option, any products listed under this warranty which is returned freight pre-paid to Seller within the earlier of one (1) year after start-up or fifteen (15) months after shipment that, upon test and examination, proves defective within the terms of this warranty. The warranty period for any item repaired or replaced shall be for the time remaining on the warranty period of the original components. Purchaser shall notify Seller in writing of such defect within sixty (60) days of discovery of the defect.

This warranty does not extend to any product sold by Seller which has been the subject of misuse, neglect, accident, damage or malfunction caused by interconnection with equipment manufactured by others, improper installation or storage, or used in violation of instructions furnished by Seller, nor does it extend to any product which has been repaired or altered by persons not expressly approved by Seller. Nor does Seller warrant equipment against normal deterioration due to environment; nor items such as thermocouples, electrodes, and similar items subject to wear or burnout through usage. Adjustments for items or equipment not manufactured by Seller shall be made to the extent of any warranty of the manufacturer or supplier thereof.

Seller shall not be liable for any special or consequential damages or for loss of damage, directly or indirectly arising from the use of the products. Seller's warranty shall be limited to replacement of defective equipment and shall not include field removal and installation expenses.

The warranty set forth above is in lieu of all other warranties either express or implied and constitutes the full extent of Air Monitor Corporation's liability to the customer, or any other party for breach of warranty. THERE ARE NO EXPRESS WARRANTIES EXCEPT AS SET FORTH HEREIN. THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, WHICH ARE PARTICULARLY DISCLAIMED.

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AIR MONITOR CORPORATION

WARRANTY

PROCESS / POWER

PRODUCTS COVERED

VELTRON II	VELTRON DPT	MASS-tron II/CEM
VEL-trol II	VELTRON DPT-*plus*	CAMM
MASS-tron II		

WARRANTY

Air Monitor Corporation (hereinafter referred to as "Seller") warrants that at the time of shipment, products sold pursuant to this contract will be free from defects in materials and workmanship, and will conform to the specifications furnished or approved in writing by Seller. No warranty is given that delivered products will conform to catalog sheets, data sheets, and the like, which are subject to change without notice.

Seller will repair or replace, at its option, any products listed under this warranty which is returned freight pre-paid to Seller within the earlier of three (3) years after start-up or thirty-nine (39) months after shipment that, upon test and examination, proves defective within the terms of this warranty. The warranty period for any item repaired or replaced shall be for the time remaining on the warranty period of the original components. Purchaser shall notify Seller in writing of such defect within sixty (60) days of discovery of the defect.

This warranty does not extend to any product sold by Seller which has been the subject of misuse, neglect, accident, damage or malfunction caused by interconnection with equipment manufactured by others, improper installation or storage, or used in violation of instructions furnished by Seller, nor does it extend to any product which has been repaired or altered by persons not expressly approved by Seller. Nor does Seller warrant equipment against normal deterioration due to environment; nor items such as thermocouples, electrodes, and similar items subject to wear or burnout through usage. Adjustments for items or equipment not manufactured by Seller shall be made to the extent of any warranty of the manufacturer or supplier thereof.

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AIR MONITOR CORPORATION

PURCHASE ORDER

The following numbers must appear on all related correspondence, shipping papers and invoices: **P.O. NUMBER: A03-011-411**

To: American Spincast 2505 Taylors Valley Road Belton, TX 76513	Ship To: ABT TO ADVISE

P.O. DATE	DELIVERY	SHIP VIA	F.O.B. POINT	TERMS
12/15/03	2/9/03	Best Way	SP, Prepay & Add	Net 30 days

ITEM	QTY	DESCRIPTION	UNIT PRICE	TOTAL
		Confirming, Do Not Duplicate		
1	4	Alloy Spun Cast Tubes, 54" long, 18" OD x 17-1/4" ID. Material ASTM A297-93, grade HE (163 lbs).	$734.00	$2,936.00
a	-	Special Instructions: - Contact S.P.Kozakewich at (908) 212-0573 prior to making shipments to confirm instructions.		
b	-	Tax Note: - ABT is exempt from sales and use taxes under guidelines as reseller.		
c	-	References: - S. Ferrara fax inquiry dated 8/11/03. - Kimberly's 'revised' quote to S.Kozakewich on 11/17/03.	**TOV**	**$2,936.00**

Authorized by Date

1. Please send two copies of your invoice.
2. Enter this order in accordance with the prices, terms, delivery method, and Specifications listed above.
3. Send all correspondence to the above address and one copy to: Advanced Burner Technologies Suite 5, 350 Main Street, Bedminster, NJ 07921: 908-470-0470; FAX:908-470-0479

Acknowledged by Date

ADVANCED BURNER TECHNOLOGIES CORPORATION
TERMS AND CONDITIONS

Article 1, Contract: This Purchase Order is the sole agreement between the Purchaser and the Seller for the work described herein. The terms of this Purchase Order consist of the provisions written on the face thereof together with any other documents incorporated therein by reference, including these terms and conditions and special conditions, technical specifications and drawings, if any. This Purchase Order is expressly limited to and is issued conditioned upon the Seller's acceptance of the terms thereof. Any provisions contained in any quotation, acknowledgment, shipping document or other document which are inconsistent with or in addition to the terms of this Purchase Order shall be of no force or effect. Written acknowledgment of this Purchase Order, or the shipment of goods or the commencement of work required by this Purchase Order, shall constitute acceptance of the terms of this Purchase Order. No changes, modifications or amendments of any of the provisions of this Purchase Order shall be valid unless agreed to by the parties in writing and signed by their authorized representatives.

Article 2, Independent Contractor: This Purchase Order shall be deemed to constitute the Seller an independent contractor, and Seller, his subcontractors, agents or employees shall not be considered servants, agents or employees of the Purchaser or its Customer.

Article 3, Interpretation: All questions concerning interpretation or clarification of this Purchase Order, or the acceptable performance thereof by the Seller, shall be immediately submitted in writing to the Purchaser for resolution. All determinations, instructions and clarifications of the Purchaser shall be final and conclusive, unless written notice of Seller's objection thereto is submitted to the Purchaser within seven days. At all times, the Seller shall proceed with the work in accordance with the determinations, instructions and clarifications of the Purchaser. The Seller shall be solely responsible for requesting interpretations or clarifications and shall be solely liable for any cost and expenses arising from its failure to do so.

Article 4, Changes: The Purchaser shall have the right, without notice to Seller's sureties, to make changes, additions or alterations to the work to be accomplished under this Purchase Order by a written notice to the Seller. If the exercise of such rights by the Purchaser causes an increase or decrease in the Purchase Order price or in the time to perform the work, the Seller shall make an appropriate written claim prior to the Seller incurring any additional costs and not later than seven days from the receipt of the notice. At all times, the Seller shall proceed with the work as directed by the Purchaser, including the implementation of changes, additions or alterations to the work as directed by the Purchaser, and notwithstanding any dispute between the Purchaser and the Seller regarding any such changes, additions or alterations.

Article 5, Assignment, Subcontracting and Location of the Work: The Seller shall not assign, transfer, convey, or otherwise dispose of this Purchase Order or any part thereof to any third party without the written consent of the Purchaser.

Except for the purchases of raw materials, no part of the work shall be sublet by the Seller to another party at any tier except with the prior written approval of the Purchaser. In the event the Seller intends to subcontract any work, the identity and location of the proposed subcontractors and the scope of their work must be submitted by the Seller for the Purchaser's approval.
To the extent that they apply, the Seller shall impose on each of his subcontractors the requirements of this Purchase Order. The Purchaser shall be furnished with three fully executed copies of all such subcontracts. Notwithstanding such subcontracts, the Seller shall have the sole and full responsibility for fulfilling all of its obligations under this Purchase Order, and the Seller shall assume full responsibility to the Purchaser and its Customer for the acts and omissions of its subcontractors and their employees as it is responsible for its own acts or omissions.

The goods furnished under this Purchase Order shall be manufactured in the Seller's own country or, for work which is subcontracted, in the country of the Seller's subcontractor. The Seller shall obtain the Purchaser's prior written approval for any goods which are manufactured in a country other than Seller's or, for work which is subcontracted, in a country other than Seller's subcontractor's.

Article 6, Drawings and Manuals: All documents (including drawings and manuals) prepared by the Seller under this Purchase Order shall be submitted to the Purchaser for review in the quantities and in accordance with the document delivery schedule specified in this Purchase Order. The Purchaser shall review such documents within thirty days after receipt. The Seller shall revise such documents in accordance with any comments or changes indicated by the Purchaser and resubmit the documents to the Purchaser. Review and approval of documents by the Purchaser or its Customer shall not relieve the Seller from its obligations to perform the work in accordance with the requirements of this Purchase Order.

Commencement of manufacture by the Seller prior to receipt of approved documents from the Purchaser shall be at the risk and expense of the Seller. The Seller shall be responsible for any additional costs or expenses incurred by the Purchaser or its Customer as a result of errors or omissions in the Seller's drawings or manuals.

Article 7, Inspection: At least two weeks prior to the commencement of the manufacture of the goods, the Seller shall notify the Purchaser in writing of the part to be manufactured, the location of the shop and the manufacturing schedule.

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In addition, the Seller shall notify the Purchaser in writing at least two weeks prior to the commencement of any shop tests in order to enable the Purchaser to witness such tests. Such notice shall describe the exact nature of the tests to be conducted. Specific requirements regarding the methods of such tests shall be agreed prior to the performance of these tests.

During each and every stage of the progress of the work the Purchaser reserves the right to inspect and test the work. The Seller shall make all necessary arrangements and provide all reasonable facilities and access for such inspection and testing. Neither observation of the work, nor inspection, test or approval of the work by the Purchaser or its Customer shall relieve the Seller from its obligations to perform the work in accordance with the requirements of this Purchaser Order.

Prior to shipment of the goods, the Seller shall deliver three copies of all inspection and test reports regarding the goods signed by the Seller's authorized personnel. The Seller shall not ship the goods until the Purchaser has either given written approval of the results of the tests or has ordered the shipment without such approval.

Article 8, Time of Performance: Within thirty (30) days after the date of this Purchase Order, the Seller shall submit to the Purchaser for the Purchaser's review and approval an overall schedule and progress chart covering all phases of the work to be accomplished by the Seller under this Purchase Order. The schedule shall be prepared in graph form with horizontal time scale in weeks. The schedule shall be updated monthly.

Time of performance by the Seller is of the essence under this Purchase Order, and the Seller shall be liable to the Purchaser for any and all losses, costs or expenses the Purchaser may incur, including damages for which the Purchaser is liable to its Customer or others, resulting from delay in performance by the Seller.

Any delay in the performance by either the Purchaser or the Seller shall be excused to the extent due to unforeseeable causes beyond their control and without their fault or negligence. The Seller shall notify the Purchaser in writing within seven days of the occurrence of such delay, and shall make every reasonable effort to minimize the effect of such delay. The Seller shall not be entitled to additional compensation as a result of delays which it incurs, whether such delays are attributable to the Purchaser or its Customer or otherwise, an extension of time being Seller's sole and exclusive remedy.

Article 9, Risk of Loss: The Seller shall have risk of loss or damage to the goods until the goods are physically delivered to the delivery point specified in the Purchase Order. In addition, the Seller shall be responsible for any loss or damage attributable to the improper packing of the goods.

Notwithstanding the above, in the event of loss or damage to the goods within one year after arrival at the jobsite, the Seller shall replace the goods at a price not more than 110% of the original Purchase Order price.

Article 10, Compliance With Laws: The Seller shall comply with all Federal, State, County, municipal and industrial (ASME, ANSI, AWS, AISC, etc.) laws, codes, regulations and rules bearing upon the work and the conditions under which it is to be performed, including but not limited to all requirements of the Occupational Safety and Health Act of 1970, as amended from time to time. In the event the Seller's work does not comply with any such laws, codes, regulations and rules, the Seller shall correct any such noncompliance at its sole expense and indemnify and hold the Purchaser and its Customer harmless from any claims, costs, fines, penalties, expenses, liabilities or losses on account of any such noncompliance.

Article 11, Patents: The Seller shall pay all royalties and license fees which may be payable on account of the work performed under this Purchase Order. The Seller shall at its own expense defend any claim brought against the Purchaser or its Customer, and their respective successors and assigns, because the work or any part thereof, including its use, infringes or is alleged to infringe directly or contributorily on any patent, copyright or other proprietary right, and the Seller shall save the Purchaser and its Customer harmless from any loss, damage, cost or liability of any nature arising out of such infringement or alleged infringement. Without limiting the foregoing, the Seller shall pay all awards or damages assessed and all costs of suit adjudged against those named in such suits or proceedings. In case any part of the work should in any such suit or proceeding be held to constitute infringement and its use be enjoined, the Seller shall within a reasonable time either (1) secure for the Purchaser and its Customer the perpetual right to continue the use of such part of the work or (2) replace or modify the work so that it becomes noninfringing, provided the performance of the work is not affected in any adverse manner.

Article 12, Insurance: During the performance of the work under this Purchase Order, the Seller shall maintain insurance coverage with the following forms and limits:

Workmen's Compensation Insurance, including Employer's Liability Insurance, for all employees of the Seller in accordance with the laws of the state or country in which the Seller may be required to pay compensation.

Comprehensive General Liability Insurance, including Contractor's Protective and Contractual Liability, with a combined single limit of at least $1,000,000 for bodily injury and property damage.

Automobile Liability Insurance, with a combined single limit of at least $1,000,000 for bodily injury and property damage.

Article 13, Indemnity: The Seller shall indemnify, defend and hold harmless the Purchaser and its Customer, and their subsidiaries and affiliates and their officers, agents and employees, from and against any and all claims, losses, costs and expenses (including attorney's fees) of whatsoever kind or nature, whether arising before or after completion of the work hereunder, in any manner directly or indirectly resulting, in whole or in part, from or in connection with the performance of the work under this Purchase Order. The Seller's aforesaid indemnity and hold harmless obligations shall apply even in the event of the fault or negligence, whether active or passive, of the parties indemnified or held harmless hereunder to the fullest extent permitted by law, but in no event shall such obligations apply to liability caused by the willful misconduct or sole negligence of the parties indemnified or held harmless hereunder.

In any and all claims against the parties indemnified or held harmless hereunder by any employee of the Seller, its subcontractors or anyone acting under its direction or control or on its behalf, the aforesaid indemnify and hold harmless obligations shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable under any workmen's compensation acts, disability benefit acts or other employee benefit acts.

Article 14, Warranty: The Seller warrants that the goods and services furnished under this Purchase Order shall be (1) new and of the best quality of its respective kind, (2) free from defects in title, design, material and workmanship, (3) in conformance with the requirements of this Purchase Order, including the technical specifications, and with all applicable codes, standards, laws and regulations, and (4) sufficient to fulfill any operating conditions specified in this Purchase Order but excluding any performance related conditions.

The Seller shall, at its expense and in a manner approved by the Purchaser, correct any work, which is or becomes non-conforming to such warranty prior to the expiration of twelve months from the date the work is placed into commercial operation. When corrections are performed, all costs incidental to the correction shall be borne by the Seller, including costs of shipment, installation at the jobsite, and reinspection and re-testing of the fabrication only. If the Seller fails to proceed with reasonable promptness to take corrective action, the Purchaser shall have the right to cause such necessary corrective work to be accomplished by others providing a cost is agreed upon by both parties prior to the start of corrective action. The Seller shall reimburse the Purchaser for all costs incurred thereby plus an administrative charge of ten percent.

The warranty period for the entire work shall be extended by the period of time the work is not in service due to a non-conformity. In addition, any correction performed hereunder and any other part of the work affected by such correction shall be rewarranted for a period of twelve months from the date the corrected part is placed into commercial operation but not less than the remaining warranty period applicable to the work.

Article 15, Suspension: The Purchaser may, at any time, suspend the work or any part thereof by giving written notice to the Seller. The work shall be resumed by the Seller within seven days after receipt of written notice from the Purchaser to the Seller to resume the work suspended.

In the event such a suspension causes a delay to the schedule or increases the cost to perform the work, an equitable adjustment shall be made to this Purchase Order, however no adjustment shall be made for any suspension to the extent that performance would have been suspended, delayed or interrupted by any other cause, including the Seller's non-compliance with the provisions of this Purchase Order.

Article 16, Termination for Convenience: The Purchaser may by written notice to the Seller terminate this Purchase Order in whole or in part at any time for the Purchaser's convenience. Upon any such termination, the Seller shall forthwith discontinue all work and the incurring of any additional expenses relating to this Purchase Order, except as may be directed by the Purchaser in the termination notice. Upon any such termination, the Purchaser shall pay the Seller for work satisfactorily performed by the Seller under this Purchase Order prior to the date of termination, based upon the percentage that the work performed bears to the total work, and provided that the total sum payable upon termination shall not exceed the Purchase Order price reduced by payments previously made. In no event will the Purchaser be responsible for payment of damages including unabsorbed shop overhead or loss of anticipated profits.

Article 17, Termination for Cause: The Purchaser may, by written notice to the Seller, terminate this Purchase Order, in whole or in part, in any one of the following circumstances:

(1) Insolvency of the Seller, the filing of a voluntary petition in bankruptcy by the Seller, the filing of any involuntary petition to have the Seller declared bankrupt, the appointment of a Receiver or Trustee for the Seller or the execution by the Seller of an assignment for the benefit of creditors;

(2) Failure of the Seller to make progress so as to endanger the performance of this Purchase Order or failure of the Seller to complete the work or any portion thereof in accordance with the schedule requirements;

(3) Failure of the Seller to perform any of the other provisions of this Purchase Order in accordance with its terms.

In the event of such termination, the Purchaser may take possession of all or any part of the work to be furnished hereunder in the Seller's possession, without regard to its stage of completion, and may complete the work for the Seller's account, or may perform or procure work similar to that to be furnished hereunder, and charge any excess cost or expense occasioned thereby to the Seller's account. In any event, the Purchaser shall not be or become liable to the Seller or anyone claiming through or under the Seller for any portion of the cost or price of any work, which the Purchaser elects not to accept following notice of termination.

Article 18, Terms of Payment: Unless otherwise stated in this Purchase Order, the Purchase Order price shall be paid by the Purchaser to the Seller as follows:

90% Thirty days after delivery of the goods to the delivery point specified in the Purchase Order and receipt of invoice.

10% Ninety days after delivery of the goods to the delivery point specified in the Purchase Order or upon completion of installation of the goods, whichever occurs first.

The Purchaser may withhold payment to secure itself against loss in the event any claims are filed against the Purchaser or its Customer relating to the Seller's performance of this Purchase Order or if reasonable evidence indicates the probability of filing of any such claims, or the Seller has violated any provision of this Purchase Order.

Article 19, Taxes: Unless otherwise stated in this Purchase Order, the Seller shall pay all taxes, levies, duties and assessments of every nature due in connection with the work performed by the Seller under this Purchase Order and shall make any and all payroll deductions required by law. The Seller shall indemnify and hold harmless the Purchaser and its Customer from any liability on account of any and all such taxes, levies, duties, assessments and deductions.

Article 20, Liens: The Seller shall make prompt payment for all labor, material and services used by the Seller in the performance of the work. In the event a lien should be filed against the work, the Seller shall at its expense, upon demand of the Purchaser, take all necessary action, by bond or otherwise, to cause any such lien to be released or discharged therefrom, and the Seller shall indemnify the Purchaser and its Customer against any loss or expense in connection therewith, including attorneys fees. The Seller waives all rights of lien against the property and premises of the Purchaser and its Customer.

Article 21, Contract Bond: Within twenty days after the date of this Purchase Order, the Seller shall provide the Purchaser with a Contract Bond, in the form set forth as required by the Purchase Order, for the faithful performance of this Purchase Order by the Seller. Such Contract Bond shall be in the amount of one hundred percent of the Purchase Order price, be issued by a surety acceptable to the Purchaser, and remain effective until the expiration of the warranty period.

Article 22, Work on Purchaser's or its Customer's Premises: The Seller, its employees and subcontractors shall comply with and observe all directions, rules, and regulations of the Purchaser or its Customer relating to work performed at the premises of the Purchaser or its Customer, including those relating to safety, fire prevention, housekeeping, maintenance and protection of the work and premises, delivery and storage of materials, ingress and egress to the premises, parking, employee conduct, public relations, and handling of labor disputes.

Article 23, Service Representative: The Seller shall provide a service representative to advise the Purchaser and its Customer on the proper installation, operation and maintenance of the work furnished under this Purchase Order.

The Purchase Order price shall be deemed to be inclusive of the cost of such services for the duration specified in the Purchase Order, if any, and for any period such services are required due to any failure of the work to comply with the requirements of this Purchase Order including the warranty.

The Seller shall be compensated for additional service time on a mutually agreed upon basis. The Seller shall be responsible for any additional costs or expenses incurred by the Purchaser or its Customer as a result of errors or omissions in the instructions or advice given by the Seller's personnel.

Article 24, Spare Parts: Two months prior to delivery of the goods the Seller shall provide the Purchaser with a list of spare parts applicable to the work. The prices for such spare parts shall remain firm and valid for orders issued by the Purchaser for such spare parts up to one year from the date of delivery of the goods.

All Terms and Conditions of this Purchase Order shall also apply to orders issued by the Purchaser for spare parts.

Article 25, Publicity: The Seller shall not make any announcement, take any photographs, or release any information concerning this Purchase Order to any member of the public, press, official body or any other third party unless prior written consent is obtained from the Purchaser.

The Seller agrees not to divulge to third parties, without the written consent of the Purchaser, any information obtained from or through the Purchaser or its Customer in connection with the performance of this Purchase Order.

Article 26, Non-Waiver: Failure by the Purchaser to insist upon strict performance of any terms or conditions of this Purchase Order, or failure or delay to exercise any rights or remedies provided herein, or failure to properly notify the Seller in the event of breach, or the acceptance of or payment for any work hereunder, or the review of failure to review designs, shall not release the Seller from any of the warranties or obligations of this Purchase Order and shall not be deemed a waiver of any right of the Purchaser to insist upon strict performance hereof or any of its rights or remedies as to any prior or subsequent default hereunder.

Article 27, Equal Employment Opportunity: In addition to compliance with such requirements as are applicable by law, the Seller agrees to comply with the Equal Employment Opportunity and Affirmative Action requirements of this Purchase Order, including but not limited to those requirements set forth in Attachment 'C' hereto.

Article 28, Governing Law: This Purchase Order shall be governed by and construed in accordance with the laws of the state in which the office from which this Purchase Order was issued is located.

Article 29, Century Date Compliance: As used in this Purchase Order, "Year 2000 Compliant" or "Year 2000 Compliance" means that performance and functionality of the hardware and software comprising the computer systems used in the conduct of the Seller's day to day business operations, and the goods and/or services furnished by Seller to Purchaser will not be affected by dates prior to, during and/or after the year 2000. In particular, the goods and/or services must, at a minimum, satisfy the following criteria, the satisfaction of which, alone, shall not establish compliance:

a) No value for a current date will, directly or indirectly, cause an interruption, error, failure or alteration in, or otherwise affect:
   i) The Seller's business operations; or
   ii) The operation of the goods or services furnished by Seller.
b) Date-based functionality must behave consistently for dates prior to, during and/or after the year 2000.
c) In all interfaces and data storage, the century in any date must be specified either explicitly or by unambiguous algorithms or inferring rules; and
d) The year 2000 must be recognized as a leap year.

Seller warrants that:

a) Its business operations, including, but not limited to, manufacturing, shipping, accounting and invoicing; and
b) The goods and/or services it provides, are "Year 2000 Compliant".

If Year 2000 Compliance of the goods and/or services is dependent in any manner on the associated use of any specific operating system, interface, hardware, software, or the like, or is otherwise restricted in any manner, Seller shall notify Purchaser in writing of such restriction without delay.

At Purchaser's request, Seller shall demonstrate at Seller's expense by means of successful testing, which may be performed in a shop and/or in the field, as specified by Purchaser, the compliance of Seller's business operations and/or the goods and/or services furnished by Seller with the above mentioned requirements.

The successful outcome of said testing shall not relieve Seller from its responsibilities and warranties under this article.

If the Seller's business operations and/or the goods and/or services furnished by Seller are not Year 2000 Compliant, Seller shall notify Purchaser in writing without delay, and Seller shall work diligently to correct such deficiency at no cost to Purchaser. The corrective work shall be performed within a schedule satisfactory to Purchaser. If Seller does not correct the deficiency within the

schedule specified, then Purchaser shall have the right, but not the obligation, to correct such deficiency. If Purchaser corrects such deficiency, Seller shall reimburse Purchaser for all costs, expenses and damages incurred by the Purchaser.

Notwithstanding anything to the contrary, if Seller fails to comply with any provisions of this article, Purchaser may deem Seller to have materially breached the Purchase Order and Purchaser may immediately terminate the Purchase Order without any liability on the part of Purchaser or its client. In such event, Seller shall be liable for any damages incurred by Purchaser and/or its client in connection with such failure.

IP7_031018

ADVANCED BURNER TECHNOLOGIES

P.O. Box 410
271 Route 202/206
Pluckemin, NJ 07978
Phone: 908-470-0470; FAX: 908-470-0479

TELECOPY COMMUNICATION

DATE: 9/30/03 **FAX NO.:** (435) 864-6670

ATTENTION OF: James Nelson

COMPANY'S NAME: Intermountain Power Service Corp.

NUMBER OF PAGES (INCLUDING COVER SHEET): 2

FROM: Sal Ferrara

VERIFICATION NUMBER: (908) 470-0721

ABT CORPORATION'S TELECOPY NUMBER:

(908) 470-0479 – Xerox Automatic (Set to receive 24 hours a day)

REMARKS: Contract 04-45606 - Burner Design Info Request

See attached letter listing information we currently need for our burner design. Please let me know whether or not this information is readily available for your submittal to us.

Note that our address has changed to the one shown in he heading of this fax. We are in the process of also obtaining letter head paper with our new address.

ADVANCED BURNER TECHNOLOGIES

350 Main Street, Suite 5
Bedminster, NJ 07921
P 908.470.0470
F 908.470.0479
www.advancedburner.com

September 30, 2003

Mr. George W. Cross, President and CEO
Intermountain Power Service Corporation
850 West Brush Wellman Road
Delta, Utah 84624

Attention: James Nelson, Contract Administrator

Reference: Contract 04-45606 -Unit 2 Low NOx Burners

Dear Mr. Nelson:
We are progressing with design of the IGS Unit 2 burners and in the process have determined that we require the below listed information to complete our design:

1. What is the diameter of the hole in the windbox for the existing burners. We intend to stay within this diameter for installation of our burners if possible to minimize field work. The drawing IPSC provided us of the existing burners shows a dimension for this, however the actual dimension is omitted from our version.

2. IPSC provided us with an average primary air mass flow of 3500 lbs/min at Unit load of 950 MW. What is the corresponding steam flow under this load condition.

3. What is OD and length of outer Oil gun tube and mounting tube bolt pattern? On drawing you provided us (269375E, Rev. 10) there are 2 drawings listed that would give us this information, drawings 135723A and 135724A. Please forward these drawings if available.

4. What is the number and diameter of bolt holes, as well as the bolt hole circle, for the existing elbow outlet flange? We also need to know the bolt hole orientation of the elbow outlet for each burner (i.e. is top bolt on the vertical centerline or does is straddle the vertical centerline)?

5. What is the size of register support brackets (channel or tube?) that run between the tube wall and the windbox wall. These are shown on drawing you provided us 294359E, however there aren't any dimension on our version.

6. What is the fuel injector tip set back dimension, from the tube wall, for the existing burners?

Please provide us with this information ASAP or advise should you require clarification on any of this requested information.

Sincerely yours,

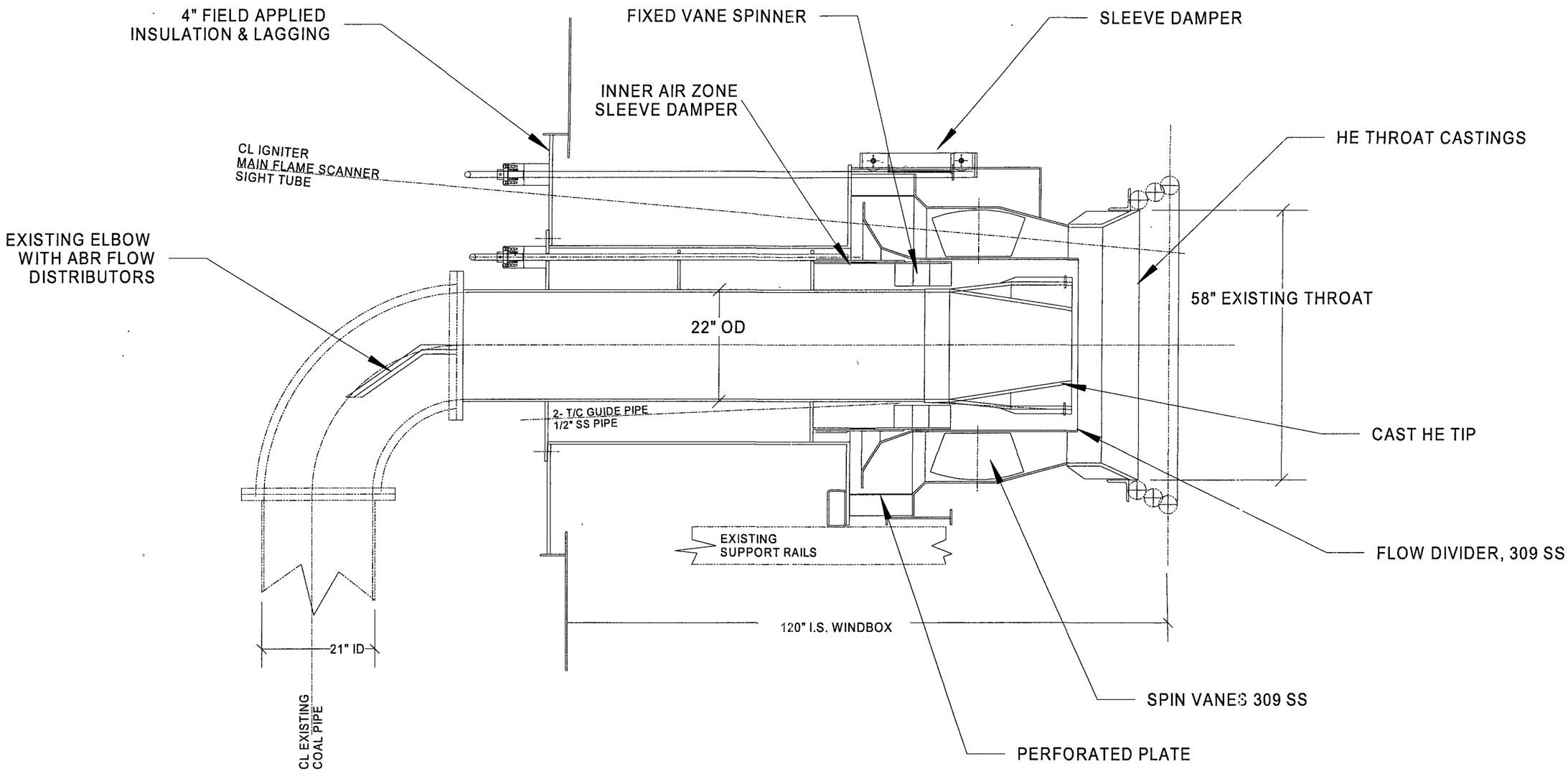
Sal N. Ferrara

cc: C. Onaitis

DISCLOSURE NOTICES

1. THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF ADVANCED BURNER TECHNOLOGIES. ANY REPRODUCTION IN PART OR WHOLE, WITHOUT THE WRITTEN PERMISSION OF ADVANCED BURNER TECHNOLOGIES IS PROHIBITED.

2. THE STRUCTURE AND OPERATION OF THE OPTI-FLOW FUEL DISTRIBUTION SYSTEM AND DUAL REGISTER ARE THE SUBJECT OF ONE OR MORE U.S. PATENT APPLICATIONS.



INSTALLATION INSTRUCTIONS

1 REMOVE ELBOW-SHIP TO SHOP FOR INSTALATION OF DISTRIBUTION DEVICES
2 REMOVE EXISTING BURNER AND FLANGE RING
3 REMOVE EXISTING SEAL RING AT FURNACE WALL
4 INSTALL NEW BURNER ASSEMBLY, CENTER IN THROAT, LEVEL, AND LOCATE END OF THROAT AT CL OF LAST TUBE
5 SHIM BETWEEN SUPPORT BAR AND EXISTING RAILS
6 SEAL WELD INSTALATION RING TO WINDBOX
7 INSTALL SEAL RING AND WELD TO WALLBOX
8 INSTALL IGNITERS AND MAIN FLAME SCANNER
9 REINSTALL REWORKED ELBOW

By	REMARKS	DATE	No.
	REVISIONS		

TOLERANCES, UNLESS SPECIFIED

	MACHINED	WELD FABRICATIONS
UP TO 6"	± .016"	± .06"
6" TO 12"	± .03"	± .09"
12" TO 24"	± .05"	± .125"
OVER 12"	± .06"	± .125"

SURFACE ROUGHNESS NOT TO EXCEED 125

BREAK SHARP CORNERS

DO NOT SCALE PRINT

CAD GENERATED DRAWING DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN CCO	11/15/02
CHECKED	

ADVANCED BURNER TECHNOLOGIES
350 MAIN STREET, SUITE 5
BEDMINSTER, NJ 07921
Phone 908-470-0478
FAX 908-470-0479
www.advancedburner.com

INTERMOUNTAIN POWER SERVICE CORPERATION

ABT PROPOSIAL NUMBER Q02003

SIZE B | DWG NO. Q03013-10 | REV 1

CAD FILE

IP7_031021

ADVANCED BURNER TECHNOLOGIES

SUITE 5, 350 MAIN STREET
BEDMINSTER, NJ 07921
Phone: 908-470-0470; FAX: 908-470-0479

TELECOPY COMMUNICATION

DATE: September 4, 2003 **FAX NO:**

ATTENTION OF: Phil Hailles

COMPANY'S NAME: IPSC

NUMBER OF PAGES (INCLUDING COVER SHEET): 4

FROM: Joel Vatsky

VERIFICATION NUMBER: (908) 470-0721

ABT CORPORATION'S TELECOPY NUMBER:

(908) 470-0479 – Xerox Automatic (Set to receive 24 hours a day)

REMARKS:
Phil:

The conversation I had earlier with James made us put on our engineering thinking caps again regarding the elbows. We have figured out a way to install our X-vane distribution assembly without requiring the elbows to leave the site.

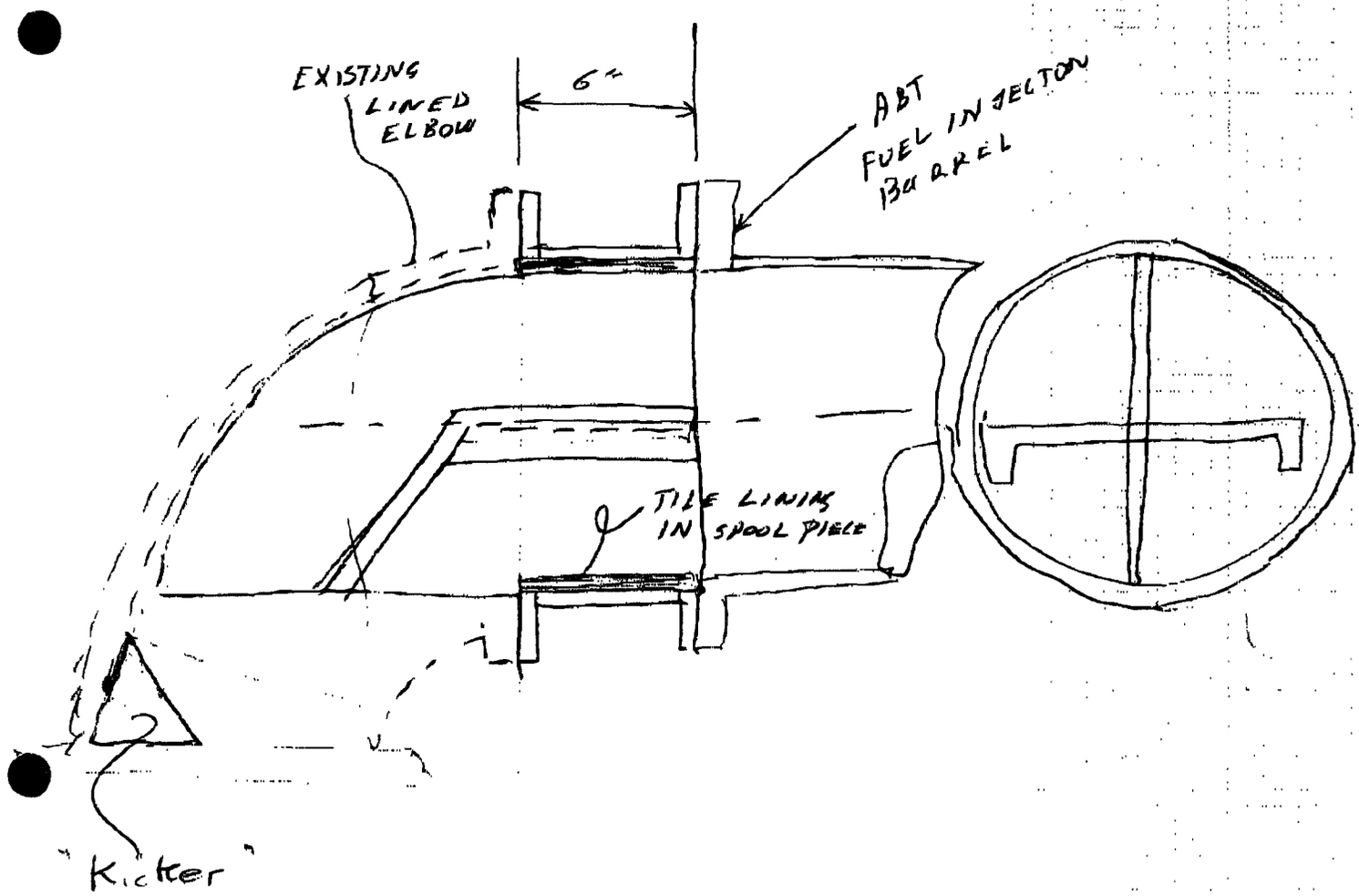
Attached is a hand sketch showing a 6" wide flanged pool piece, lined, to which the X-vanes are attached. This is first bolted to the elbow and becomes one ass'y, which is then bolted to the fuel tube (made 6" shorter). Taking into account the shipping and shop savings we would accrue, there is an additional cost of $850.00 per burner. However, it has the advantage of giving the performance we want while keeping the elbow and X-vanes separate (similar to what we do with the flatback elbow, except in this case we do the attachment from the outlet end rather than the back). The kicker can be field installed. We are checking with our fabricator to see if they can send two of their people out to do this, rather than rely on the field labor.

If you prefer to have the elbows completely relined, our shop can do it within the same two week period allotted. The additional cost is $1000.00 per burner.

We can go either way. If the elbows have additional life it may not be necessary to reline them now. But this is your call.

I hope this sets this issue to bed.

Please call or e-mail to let us know you have received this FAX.
Regards,
Joel



X-VANE SPOOL PIECE

IPP
GEO 09/04/03
ABT

ADVANCED BURNER TECHNOLOGIES

SUITE 5, 350 MAIN STREET
BEDMINSTER, NJ 07921
Phone: 908-470-0470; FAX: 908-470-0479

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VERIFICATION NUMBER: (908) 470-0721

ABT CORPORATION'S TELECOPY NUMBER:

(908) 470-0479 – Xerox Automatic (Set to receive 24 hours a day)

REMARKS:

Phil:

Attached are:

Photo of the "Kicker" that drops down into the elbow and is supported from the lip of the opening and a curved arm; in a flatmack elbow. A dwg is also provided.

In your sweep elbow, the SiC kicker will be shop-installed. Should last many years.

Also a dwg of the X-vanes ass'y as installed in a flatback elbow at Pirkey. The same type of device will be shop-installed in the sweep elbow. This is also lined with tile.

We have four units with various versions of this system installed; the oldest is since 1999.

Let us know if you need anything further.

Joel

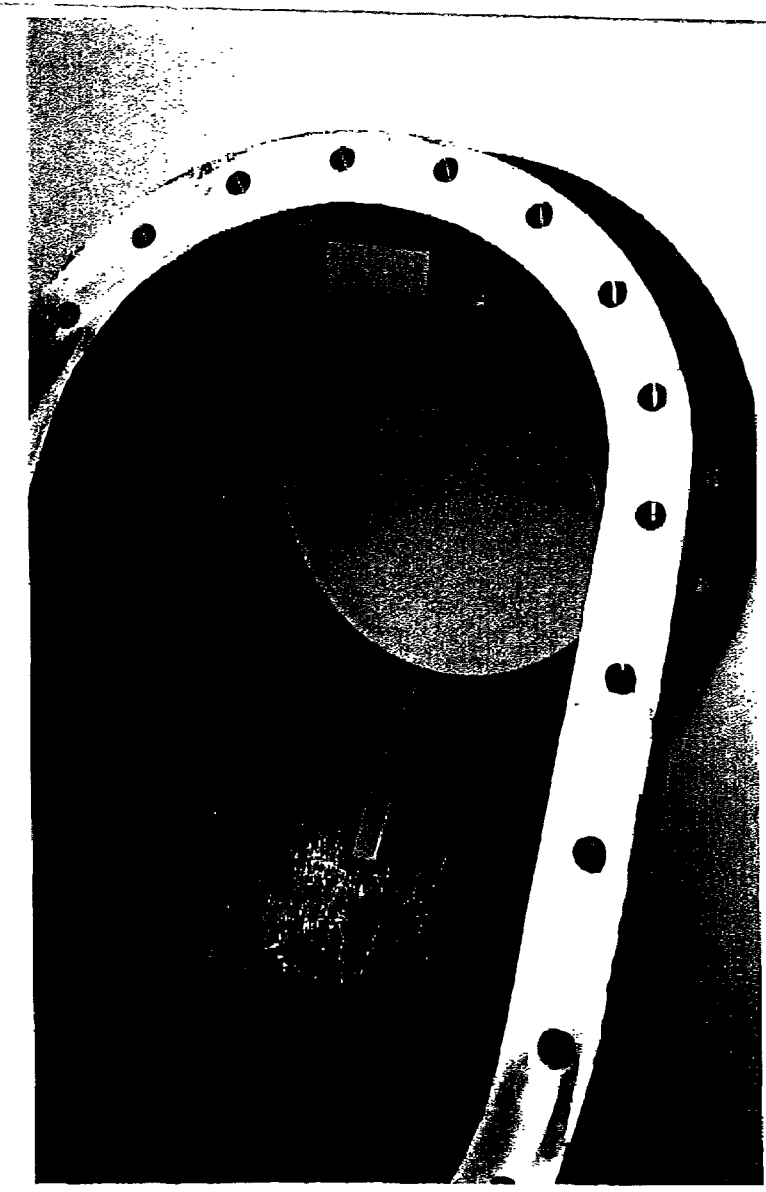
I

ABT

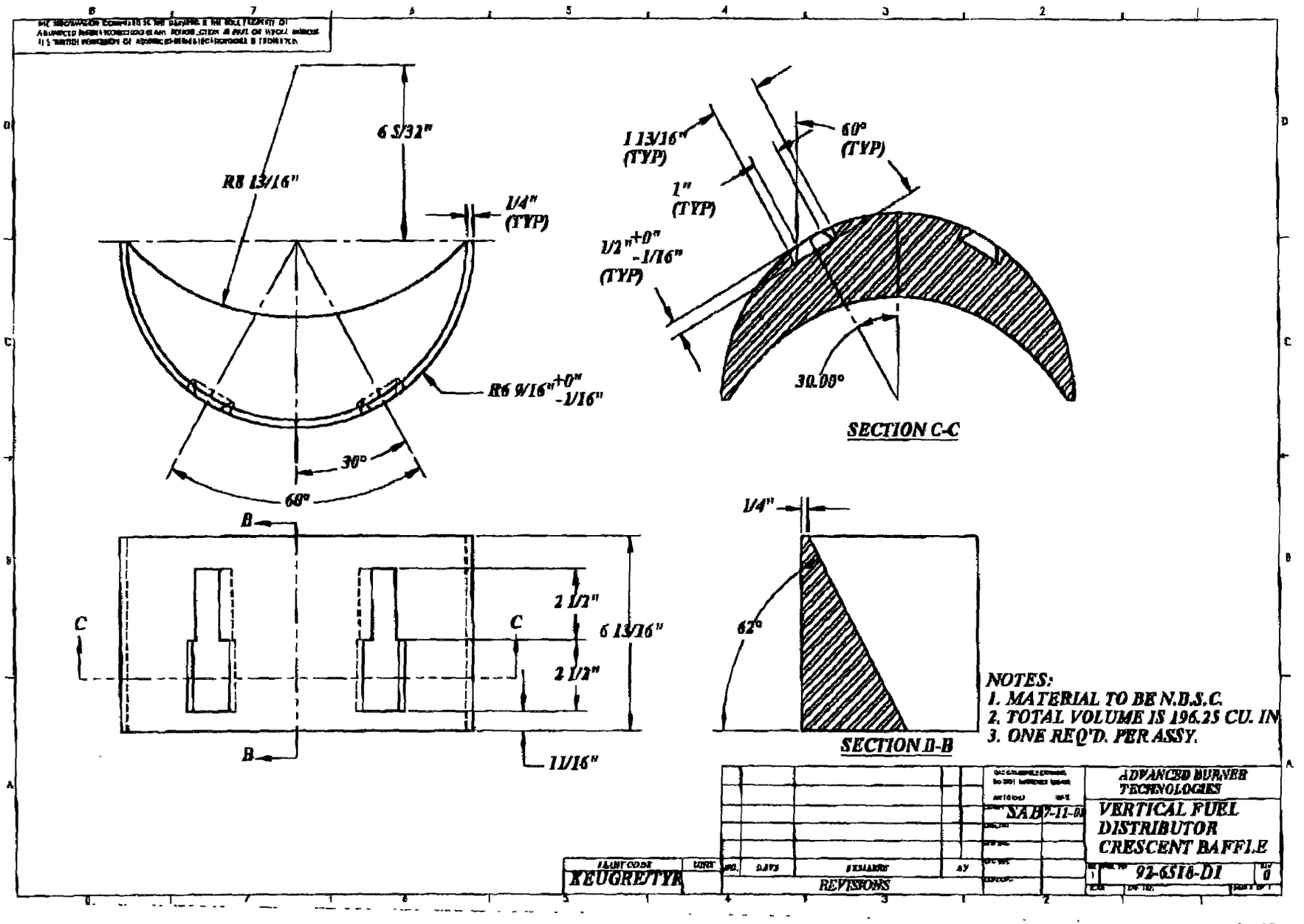
Elbow "Kicker" looking down thru flat back opening

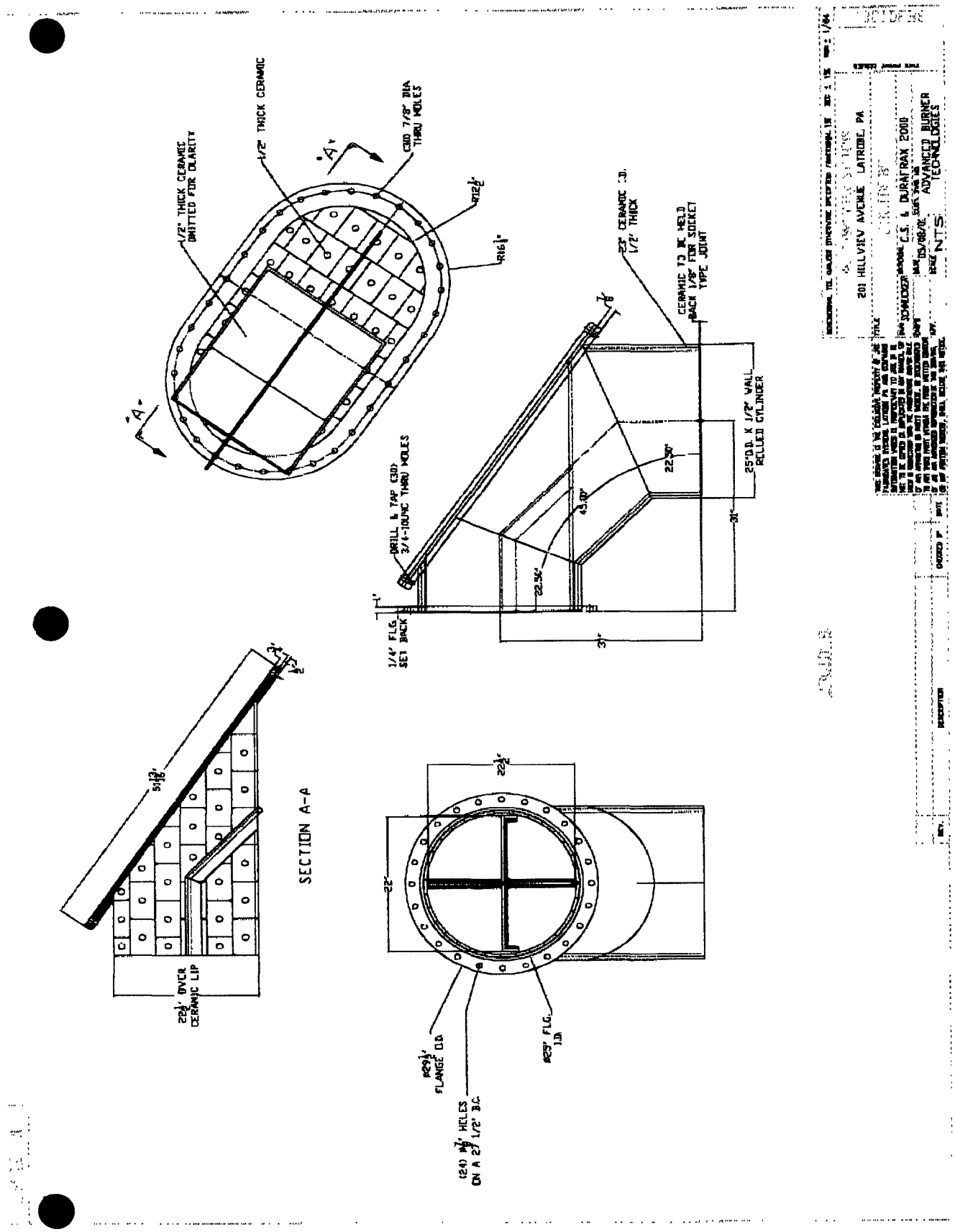
Installation will be different in ceramic-lined swoop elbow - done in shop

this is installed in AEP/SWEPCO Welsh #1 since Fall '99
Also, 2 B&W units early.



ATTN: SAL. F


6 5/32"
R8 13/16"
1/4" (TYP)
R6 9/16" +0" -1/16"
30°
60°
B
C
2 1/2"
6 13/16"
2 1/2"
1 1/16"
1 13/16" (TYP)
60° (TYP)
1" (TYP)
1/2" +0" -1/16" (TYP)
30.00°
SECTION C-C
1/4"
62°
SECTION B-B
NOTES:
1. MATERIAL TO BE N.D.S.C.
2. TOTAL VOLUME IS 196.25 CU. IN
3. ONE REQ'D. PER ASSY.
ADVANCED BURNER TECHNOLOGIES
VERTICAL FUEL DISTRIBUTOR CRESCENT BAFFLE
92-6516-D1
REVISIONS
KEUGRE/TYR


1/2" THICK CERAMIC
1/2" THICK CERAMIC DNITTED FOR CLARITY
(30) 7/8" DIA THRU HOLES
R12½"
R16½"
"A"
23" CERAMIC O.D. 1/2" THICK
CERAMIC TO BE HELD BACK 1/8" FOR SOCKET TYPE JOINT
25" O.D. X 1/2" WALL ROLLED CYLINDER
DRILL & TAP (30) 3/4-10UNC THRU HOLES
22.50"
45.00"
31"
1/4" FLG. SET BACK
SECTION A-A
22½" OVER CERAMIC LIP
22½"
22"
R29½" FLANGE O.D.
(24) 7/8" HOLES ON A 27 1/2" B.C.
R25" FLG. I.D.
201 HELLVIEW AVENUE LATROBE, PA
C.S. & DURAFRAX 2000
ADVANCED BURNER TECHNOLOGIES
NTS

IP7_031027

IGS03 - F Unit 2 Burner Modifications
Economic Justification Calculations

Summary	
PV of Project Savinc	$1,091,331
Benefit/Cost Ratio	1.24
Payback Period	1 yr
Total Return	24%
Internal Rate of Retu	18% This was calculated by shifting Time=0 savings to the 1 year.

Initial Capital Expenditures w/Project (-$)	$ (4,500,000)	*This is the cost of completing the capital project Outgoing money is negative*
Initial Capital Savings w/Project (+$)	$ 5,069,000	*This is the immediate (Time = 0) savings that the capital project will create Incoming (i.e. saved) money is positive*
Total Initial Capital Savings or Costs w/Project (+/-$)	$ 569,000	*This is the net gain or loss of money at Time = 0, if the capital project is completed*
Annual Expected Maintenance Expenses w/Project (-$)	$ (36,000)	*This is the annual maintenance costs that are expected after the capital project is completed.*
Annual Maintenance Expenses w/o Project (-$)	$ (72,000)	*This is the annual maintenance costs that are occurring without the capital project*
Annual Maintenance Savings w/Project (+/-$)	$ 36,000	*This is the annual net gain or loss of money if the project is completed.*
O & M Escalation (%)	3	
Cost of Capital (%)	6 04	

	Time Period	Capital	PV Capital	Annual Maint Savings w/Esc	PV Maint Costs	
Capital at Time = 0	0	$569,000	$569,000			$(4,500,000)
	1			$36,000	$33,949	$5,105,000
	2			$37,080	$32,976	$37,080
	3			$38,192	$32,031	$38,192
	4			$39,338	$31,113	$39,338
	5			$40,518	$30,221	$40,518
	6			$41,734	$29,354	$41,734
	7			$42,986	$28,513	$42,986
	8			$44,275	$27,695	$44,275
	9			$45,604	$26,901	$45,604
	10			$46,972	$26,130	$46,972
	11			$48,381	$25,381	$48,381
	12			$49,832	$24,653	$49,832
	13			$51,327	$23,947	$51,327
	14			$52,867	$23,260	$52,867
	15			$54,453	$22,593	$54,453
	16			$56,087	$21,945	$56,087
	17			$57,769	$21,316	$57,769
	18			$59,503	$20,705	$59,503
	19			$61,288	$20,112	$61,288
	20			$63,126	$19,535	$63,126
Present Value Totals		-	$569,000	-	$522,331	

IP7_031028

Breakdown of the Values Used in the Above Calculations

Initial Capital Expenditures w/Project		
Engineering Labor	$ 10,000	
IPSC Labor	$ 10,000	
Contract Labor	$ 1,480,000	
Material	$ 3,000,000	
Total		$ 4,500,000
Initial Capital Savings w/Project		
Days Saved By Not Extending the Outage	3	
Costs Per MWHr of Lost Generation ($/hr)	25	
Generation Lost (MW)	875	
		$ 1,575,000
Alternative Costs to Repair Burners		
Labor	$ 1,900,000	
Material	$ 1,594,000	
		$ 3,494,000
		$ 5,069,000

Internal Rate of Return	18%
Guess	1

IP7_031029

Contract 04-45606 Cost Summary

The total cost of this contract to supply burners and options is:

Costs	
Burners	$2,237,415
ABB Scanners	$212,515
Option 2 (SMCS)	$10,000
Option 5 (Parts)	$11,288
Performance Bond	$15,000
Professional Liability Premium	$60,000
Total	**$2,546,218**

From: "Sal Ferrara" <sal@advancedburner.com>
To: "Pat Finlinson" <Pat-F@ipsc.com>
Date: 9/4/2003 12:41:47 PM
Subject: *Re: Intermountain Power Q03013*

Pat,
After discussion on the revised insurances requirements with our insurer, based on clarifications in our proposal and recent discussions with you on our limits, "SPECIAL CONDITIONS, 6b, Commercial General Liability", should be revised further as I shown on attached.
The standard IPSC endorsement forms you provided are broader than our policy allows and would require considerable modification to make them agree with these revised requirements. We would prefer that IPSC waive the requirement to show evidence on your forms, as suggested in your 9/2/03 email, and we would provide a complete copy of our policy (excluding premium pages).

Please let me know if this is acceptable.
regards,
Sal

----- Original Message -----
From: "Pat Finlinson" <Pat-F@ipsc.com>
To: "<"Sal Ferrara"" <sal@advancedburner.com>
Cc: "Phil Hailes" <Phil-H@ipsc.com>
Sent: Wednesday, September 03, 2003 2:19 PM
Subject: Intermountain Power Q03013

> Mr. Ferrara,
>
> Thank you for the information regarding the increase in premium. I had
> our purchasing department incorporate your exceptions, as altered by our
> conversation, into the agreement. I am attaching the insurance
> provisions for you to review. Please let me know if they are
> acceptable. Again, thank you for your efforts.
>
> Pat Finlinson
>

CC: "Phil Hailes" <Phil-H@ipsc.com>

6. Insurance Requirements: Prior to the start of the Work, but not later than thirty (30) calendar days after date of award of Contract, Contractor shall furnish IPSC evidence of coverage from insurers acceptable to IPSC and in a form acceptable to IPSC Insurance Analyst. Such insurance shall be maintained by Contractor and at Contractor's sole cost and expense.

   Such insurance shall not limit or qualify the liabilities and obligations of Contractor assumed under the Contract. IPA, IPSC, or LADWP shall not, by reason of any of their inclusion under these policies or otherwise, incur liability to the insurance carrier for payment of the premium for these policies.

   Any insurance carried by IPA, IPSC, or LADWP which may be applicable is and shall be deemed excess insurance, and Contractor's insurance is and shall be primary for all purposes despite any provision in Contractor's policies to the contrary.

   Should any portion of the required insurance be on a "Claims Made" policy, Contractor shall, prior to the policy expiration date following completion of the Work, provide evidence that the "Claims Made" policy has been renewed or replaced with the same limits and terms and conditions of the expiring policy at least for the Contract under which the Work was performed.

   a. Workers' Compensation/Employer's Liability: Workers' Compensation Insurance covering all of Contractor's employees in accordance with the laws of all states in which the Work is to be performed and including Employer's Liability Insurance, and as appropriate, Broad Form All States Endorsement. The limit for Employer's Liability coverage shall be not less than $1 million each accident and shall be a separate policy if not included with Workers' Compensation coverage. Evidence of such insurance shall be an endorsement to the policy providing for a thirty (30) calendar days prior written notice of cancellation or nonrenewal of a continuous policy to IPSC, by receipted delivery.

b. Commercial General Liability: Commercial General Liability with Blanket Contractual Liability, Products and Completed Operations, Broad Form Property Damage, Premises and Operations, Independent Contractors, and Personal Injury coverages included. Such insurance shall provide coverage for total limits actually arranged by Contractor, but not less than $2.5 million Combined Single Limit. Should the policy have an aggregate limit, such aggregate limits should not be less than $2.5 million. Umbrella or Excess Liability coverages may be used to supplement primary coverages to meet the required limits. Evidence of such coverages shall be on IPSC's Additional Insured Endorsement Form or on an endorsement of the policy acceptable to IPSC or copy of Contractor's policy and provide for the following:

(1) To include IPA, IPSC, LADWP, and their officers, agents, and employees as additional insured with the Named Insured for the activities and operations under and in connection with the Contract.

(2) That the insurance is primary and not contributing with any other insurance maintained by IPA, IPSC, or LADWP.

(3) That the policy shall not be subject to cancellation, change in coverage, reduction of limits or nonrenewal of a continuous policy, except after written notice to IPSC, by receipted delivery, no less than thirty (30) calendar days prior to the effective date thereof.

(5) A description of the coverages included under the policy.

c. Commercial Automobile Liability: Commercial Automobile Liability covering the use of owned, nonowned, hired, and leased vehicles for total limits actually arranged by Contractor, but not less than $1 million Combined Single Limit. Such insurance shall include Contractual Liability coverage. The method of providing evidence of insurance and requirements for additional insureds, primary insurance, notice of cancellation, and Severability-of-Interest shall be the same revised requirements in the Commercial General Liability Section of terms and conditions.

d. Professional Liability: Contractor shall provide Professional Liability Insurance covering Contractor's liability arising from errors and omissions made directly or indirectly during the execution and performance of the Contract and shall provide coverage of $2.5

million Combined Single Limit. Such insurance shall be an endorsement to the Commercial General Liability Policy without separate aggregate.

The policy shall not be subject to cancellation, change in coverage, reduction of limits, or nonrenewal of a continuous policy, except after written notice to IPSC, by receipted delivery, not less than thirty (30) calendar days prior to the effective date thereof.

e. Other Conditions: Contractor shall be responsible for all subcontractors' compliance with these revised insurance requirements. The foregoing remedies in subsection (1) shall be available to IPSC against Contractor for any failure by any subcontractor to maintain and provide the required insurance.

From: Pat Finlinson
To: Ferrara, Sal
Date: 9/4/2003 1:07:47 PM
Subject: Re: Intermountain Power Q03013

Sal,

Thank you for the response. Your requests are acceptable. I have asked our contract people to replace the last sentence in paragraph 6b with the following:

"Evidence of such coverage shall be on IPSC's Additional Insured Endorsement Form, on an endorsement of the policy acceptable to IPSC, or a complete copy of the coverage and exclusions portions of the policy. The evidence of coverage should provide for the following:"

I also changed the requirement in the workers' compensation paragraph from our special endorsement to a certificate. Given the scope of the project as I understand it a certificate of WC coverage will be more than adequate. Again, thanks for your input. We look forward to working with you.

pf

>>> "Sal Ferrara" <sal@advancedburner.com> 9/4/2003 12:46:55 PM >>>
Pat,
After discussion on the revised insurances requirements with our insurer, based on clarifications in our proposal and recent discussions with you on our limits, "SPECIAL CONDITIONS, 6b, Commercial General Liability", should be revised further as I shown on attached.
The standard IPSC endorsement forms you provided are broader than our policy allows and would require considerable modification to make them agree with these revised requirements. We would prefer that IPSC waive the requirement to show evidence on your forms, as suggested in your 9/2/03 email, and we would provide a complete copy of our policy (excluding premium pages).

Please let me know if this is acceptable.
regards,
Sal

----- Original Message -----
From: "Pat Finlinson" <Pat-F@ipsc.com>
To: "<"Sal Ferrara"" <sal@advancedburner.com>
Cc: "Phil Hailes" <Phil-H@ipsc.com>
Sent: Wednesday, September 03, 2003 2:19 PM
Subject: Intermountain Power Q03013

> Mr. Ferrara,
>
> Thank you for the information regarding the increase in premium. I had
> our purchasing department incorporate your exceptions, as altered by our
> conversation, into the agreement. I am attaching the insurance
> provisions for you to review. Please let me know if they are
> acceptable. Again, thank you for your efforts.
>
> Pat Finlinson
>

CC: Hailes, Phil

Contract 04-456-06 Comments, Exceptions and Additions

Exception/Change
ABT 5.2 Payment Schedule

20%	Burner material on order
10%	Upon submittal of burner and flame detection system and general arrangement drawings.
30%	Upon commencement of burner fabrication.
30%	Upon receipt of all burners on the job site.*
10%	Upon start-up and adjustment of burners.

* Early shipment is acceptable, with storage at IPP.

Addition
ABT 3.1 Opti-Flow Low NOx Burners

Also include the following feature:

Ratchet type actuators are to be provided for moving the sleeve damper and spin vane ring. In addition, the dual-handle control features for both the damper and spin vane ring are to be retained.

Addition
ABT A2-2 ABB

IPP selects the ABB scanner with noted exceptions (see the section below). Include with that selection, Option 2 and Option 5. Option 2 is for the Safe Flame Sensor Module Communication Server (SMCS) at a cost of $10,000. Option 5 is the Safe flame DFS recommended Spare Parts, at a cost of $11,288.

Addition
ABT A2-2 ABB, pages 1 and 2

ABB has quoted 16 amplifier enclosures to be located at the burner with front-access chassis. IPP requires to locate the amplifiers and enclosures near the control room, to minimize boiler washdown damage. IPP requires the chassis to be rear-access with (2) cabinets of 24-inch depth containing 8 chassis, rather than the (26) called-out. This will require increasing the cable runs from 50 feet, to approximately 500 feet. This should be provided for in the contract.

IPP intends to provide local-indication, at the burner, for a flame intensity value. IPP will provide the instrumentation for this local-indication requirement.

Flame Scanners for New Burners -
3 Sept 03, by Jerry C. Finlinson, Bill Morgan

Modifications to Advanced Burner Tech (ABT) bid

1) We recommend going with the ABB flame scanners, instead of Iris Eye, + $55,000.
a - we had several negative reference on IRIS eye,
b - IRIS doesn't include fiberoptic lens (Narrow field of view),
c- IRIS didn't include the correct number of cabinets in bid,
d- ABB will interface easier with our new DCS

2) We require ABB Option 2 - Safe Flame Sensor Module Communication Server (SMCS) allowing all scanner intensity values to be pulled into DCS over serial 485 communications (MODBUS). + $10,000.

3) We require ABB Option 5 - Safe Flame DFS recommended Spare Parts, + $11,288.

4) We need a further modification to the ABB bid. They have quoted 16 amplifier enclosures to be located at the burner front with front access chassis. We prefer to locate the amplifiers in the 3rd floor relay room to minimize washdown damage. The chassis will be rear access with two cabinets of 24 inch depth containing 8 chassis. Decreasing the number of cabinets from 16 small ones to 2 large ones should lower the bid by -$5K, but increasing the cable lengths from 50 ft to 500 ft @ $1.20/ ft x 48 burners = $29K + $20K labor increase. ABB will provide the 2 cabinets in the control room and all the equipment to and including the local signal junction box.

5) We plan to send either a 4-20 mA signal back upstairs to the burner front to display the flame intensity value on an analog display or a relay output signal to indicate flame proven for an LED light from each amplifier. IPSC will provide the analog meters (est $25K) or LED lights (est $8K) and cabinets.

From: "Sal Ferrara" <sal@advancedburner.com>
To: "Phil Hailes" <Phil-H@ipsc.com>
Date: 9/3/2003 2:39:52 PM
Subject: Re: Exception.....6.8 Div F2,

Phil,
Your spec. paragraph, Article 5e (Section 6.8 Division F2.....), can remain as written. We were clarifying what we intend on supplying to meet your requirement. We are just unsure of the terminology "cold junction block" however we believe we are incompliance with this. If not, we would supply whatever you need on thermocouple termination interface.

Also, I attached additional clarifications to our proposal Section 6.4 in answer to your telephone questions from earlier today. Please let me know if there is anything else you need.
regards,
Sal
----- Original Message -----
From: "Phil Hailes" <Phil-H@ipsc.com>
To: <sal@advancedburner.com>
Sent: Wednesday, September 03, 2003 3:04 PM
Subject: Exception.....6.8 Div F2,

> Sal,
>
> When you sent your hard copy book, you did not include page 4 of
> section 6. We discovered the error when reviewing the electronic
> version that you had recently sent to me.
>
> That being said, your exception to Article 5e (Section 6.8 Division
> F2.....), isn't workable to us. We need to leave the paragraph as-is.
> We need to have the temperature signals ran to a cold junction block out
> side the windbox. Perhaps you're not disagreeing with our statement,
> but merely adding to it.
>
> Comments?
>
> Phil
>

From: "joel" <joel@advancedburner.com>
To: "Phil Hailes" <Phil-H@ipsc.com>
Date: 9/3/2003 10:54:46 AM
Subject: Re: Guarantee Clarification

Sorry, I should have reiterated what I mentioned on the phone the other day:

The burners are sized for one mill out to allow continous operation without excessive velocities, which would occur if we used the all mills in service case as the design point and the unit was then operated for long periods of time with one mill out. One out of 8 mills does not create a significant problem.

The NOx emission guarantee holds with all mills in or one mill out. The NOx is slightly lower when a top mill is out and slightly higher, as compared to all mills in, with a bottom mill out. In the introduction,1-1, we mentioned one mill out with a NOx range of 0.3 -0.35. The guarantee page lists 0.33 in section 4-4 but does not specify teh number of mills(intended to allow one mill out or all mills in).

I understand where the confusion comes from: the guarantee vs predicitons and ranges which are provided for information.

Guarantee: 0.33 7 or 8 mills.

Joel

----- Original Message -----
From: "Phil Hailes" <Phil-H@ipsc.com>
To: <joel@advancedburner.com>
Sent: Wednesday, September 03, 2003 10:59 AM
Subject: Re: Guarantee Clarification

> Yes. But is this guarantee at 7 mill or 8 mill operation. I believe
> that you are saying 7 mill operation (page 1-1). Correct?
>
> >>> "joel" <joel@advancedburner.com> 9/3/2003 9:03:55 AM >>>
> Phil:
>
> What we have guaranteed is specified in section 4: NOx, with OFA
> ports
> closed, not to exceed 0.33, CO not to exceed 200ppm and no change in
> LOI
> provided the conditions of fuel and mill are met.
>
> The NOx levels with 10 and 20% OFA flow are predicted only. We cannot
> guarantee emissions with someone else's OFA system. Although we would
> with
> our OFA system; and possibly lower. But we have not investigated this
> since
> you have already purchased the OFA system from others.
>
> However, our predictions with OFA ports open are realistic and the
> boiler
> will operate in the range we predict.

>
> Joel Vatsky
>
>
> ----- Original Message -----
> From: "Phil Hailes" <Phil-H@ipsc.com>
> To: <sal@advancedburner.com>
> Cc: <joel@advancedburner.com>
> Sent: Wednesday, September 03, 2003 10:02 AM
> Subject: Guarantee Clarification
>
>
> > Please clarify your emission guarantees for me. Specifically, the
> > number of mills in operation for each level. .
> >
> > 1) 7 or 8 Mills, 0% OFA, NOx = .33, CO <200, LOI = no change.
> > 2) 7 or 8 mills, 10% OFA, NOx = .29, etc
> > 3) 7 or 8 mills, 20% OFA, NOx = .25, etc.
> >
> >
> > As I under Joel last week, the guarantees apply whether or not it is
> 7
> > or 8 mills in operation.
> >
> > Thanks
> > Phil
> >
>
>

CC: "Ferrara, Sal N." <Sal@advancedburner.com>

From: "Sal Ferrara" <sal@advancedburner.com>
To: "Pat Finlinson" <Pat-F@ipsc.com>
Date: 9/3/2003 11:39:36 AM
Subject: Re: Intermountain Power - Proposal No. Q03013

Pat,
Our insurer advised that the total additional premium to increase our PL limit to $2.5 million would be $60,000. Note that since you would accept most of our exceptions to IPSC insurance requirements, we would modify your emailed forms accordingly, prior to submitting them to show evidence. Please let me know if you have other questions.
regards,
Sal
----- Original Message -----
From: "Sal Ferrara" <sal@advancedburner.com>
To: "Pat Finlinson" <Pat-F@ipsc.com>
Cc: "joel vatsky" <joel@advancedburner.com>; "Phil Hailes" <Phil-H@ipsc.com>; "James Nelson" <JIM-N@ipsc.com>
Sent: Tuesday, September 02, 2003 6:09 PM
Subject: Re: Intermountain Power - Proposal No. Q03013

> Pat,
> In our telephone discussion today, you indicated that it would be acceptable
> that we show evidence of insurance up to the "value of the material supply
> portion of the contract". In this case we would have to increase our
> Professional Liability policy (PL) to $2.5 million. Our insurer recently
> advised us that the additional premium to increase our PL to $2 million
> would be $37,000. I don't have an answer from them yet on increasing it by
> another $1/2 million, but I expect the increase will be somewhat linear
> (approx. another $20,000). I will let you know as soon as I hear back from
> our insurer.
> regards,
> Sal
> ----- Original Message -----
> From: "Pat Finlinson" <Pat-F@ipsc.com>
> To: <sal@advancedburner.com>
> Cc: "James Nelson" <JIM-N@ipsc.com>; "Phil Hailes" <Phil-H@ipsc.com>
> Sent: Tuesday, September 02, 2003 1:41 PM
> Subject: Intermountain Power - Proposal No. Q03013
>
>
> > Mr. Ferrara,
> >
> > Phil Hailes has asked that I review your comments and objections
> > regarding the risk and insurance provisions of our request for bid
> > documents. I understand that the contract has not yet been awarded.
> > However, knowing where we stand on these important issues with the
> > various bidders makes the decision somewhat easier.
> >
> > Your proposed addition to our limitation of liability is acceptable
> > provided you show evidence of insurance up to the value of the contract.
> > Please let us know as soon as possible what the additional premium will
> > be. This will obviously impact our decision.
> >

> > We can live with most of your exceptions to our insurance requirements.
> > However, evidence of insurance must be provided on our endorsement
> > forms. Certificates will not suffice. We can waive this requirement
> > only if you provide us with a complete copy of your policy. I have
> > attached copies of our forms to this email for your review. Most of the
> > major brokers have used our forms with us or with the City of Los
> > Angeles. If professional liability coverage is to be added by
> > endorsement rather than by a separate policy a copy of the endorsement
> > adding that coverage will suffice.
> >
> > As mentioned above, limits of insurance in either professional
> > liability or commercial general liability with a products and completed
> > operations component must be raised to at least the contract price.
> >
> > It will benefit all involved to try and resolve these issues as soon as
> > possible. You may contact me directly at 435-864-6567. I look forward
> > to hearing from you.
> >
> > Pat Finlinson
> > Risk & Insurance Analyst
> >
> >
> >
>

CC: "James Nelson" <JIM-N@ipsc.com>, "Phil Hailes" <Phil-H@ipsc.com>, "joel vatsky" <joel@advancedburner.com>

From: "Sal Ferrara" <sal@advancedburner.com>
To: "Phil Hailes" <Phil-H@ipsc.com>
Date: 9/2/2003 3:43:36 PM
Subject: Re: ABT Burner Proposal

Phil,
We have had good success with 309 SS on our burner parts that are directly exposed to furnace radiation, on units having larger burner throats than the IGS Unit. We have not used the 253 MA material in the past however are open to suggestions you may have on using this material on specific components of our burner. The chemistry and temperature resistant properties of the 253 material is similar to 309, so we would not expect much change in longevity under high temperature applications. Our burner fabricator advises that welding and forming of the 253 material is slightly more difficult than 309, however not to the point where it would effect their labor costs. We do not have sufficient information at this point on cost difference between 253 and 309 plate material, but we are investigating this.

In answer to other questions you asked in our phone discussion:

1. Referencing our proposal Section 3.4, our pricing includes the flow modeling and supply of material depicted by the model as being necessary to balance the duct and burner windboxes.

2. Referencing our Proposal Section 6.1, the cost of the construction performance bond would be additional to pricing we provided on the bid document pricing sheet. We estimated the bond price to be $15,000 based on a bond for 50% of the installation price. The cost would be less if you required a bond for only 10% of the installation price.

I trust this answers all your question. Please let me know if there is anything else.
regards,
Sal

----- Original Message -----
From: "Phil Hailes" <Phil-H@ipsc.com>
To: <joel@advancedburner.com>
Cc: <Chuck@advancedburner.com>; <Sal@advancedburner.com>
Sent: Tuesday, September 02, 2003 9:31 AM
Subject: Re: ABT Burner Proposal

> Joel,
>
> In lieu of the 309 SS material, do you have other materials that you
> are willing to manufacture the burners out of? We've had some success
> with RM 253 over 309SS.
>
> Phil
>

CC: "joel vatsky" <joel@advancedburner.com>

From: Pat Finlinson
To: sal@advancedburner.com
Date: 9/2/2003 11:41:51 AM
Subject: Intermountain Power - Proposal No. Q03013

Mr. Ferrara,

Phil Hailes has asked that I review your comments and objections regarding the risk and insurance provisions of our request for bid documents. I understand that the contract has not yet been awarded. However, knowing where we stand on these important issues with the various bidders makes the decision somewhat easier.

Your proposed addition to our limitation of liability is acceptable provided you show evidence of insurance up to the value of the contract. Please let us know as soon as possible what the additional premium will be. This will obviously impact our decision.

We can live with most of your exceptions to our insurance requirements. However, evidence of insurance must be provided on our endorsement forms. Certificates will not suffice. We can waive this requirement only if you provide us with a complete copy of your policy. I have attached copies of our forms to this email for your review. Most of the major brokers have used our forms with us or with the City of Los Angeles. If professional liability coverage is to be added by endorsement rather than by a separate policy a copy of the endorsement adding that coverage will suffice.

As mentioned above, limits of insurance in either professional liability or commercial general liability with a products and completed operations component must be raised to at least the contract price.

It will benefit all involved to try and resolve these issues as soon as possible. You may contact me directly at 435-864-6567. I look forward to hearing from you.

Pat Finlinson
Risk & Insurance Analyst

CC: Hailes, Phil; Nelson, James

PROFESSIONAL LIABILITY – SPECIAL ENDORSEMENT
INTERMOUNTAIN POWER SERVICE CORPORATION

In consideration of the premium charged and not withstanding any inconsistent statement in the policy to which this endorsement is attached or any endorsement now or hereafter attached thereto, it is agreed as follows:

1. **APPLICABILITY.** This insurance pertains to the operations and/or tenancy of the Named Insured under all written agreements in force with the Intermountain Power Service Corporation unless checked here ___ in which case only the following specific agreements with Intermountain Power Service Corporation are covered:

2. **CONTRACTUAL LIABILITY.** Insurance afforded by this policy shall apply also to the liability assumed by the Named Insured under contract with Intermountain Power Service Corporation, provided such liability results from an error, omission, or negligent act of the Named Insured, its officers, agents, employees, or subcontractors.

3. **CANCELLATION NOTICE.** With respect to the interests of Intermountain Power Service Corporation, this insurance shall not be canceled, materially reduced in coverage or limits, or nonrenewed unless thirty (30) days prior written notice by receipted delivery is given to the Intermountain Power Service Corporation addressed as follows: Intermountain Power Service Corporation, Insurance Analyst, 850 West Brush Wellman Road, Delta, Utah 84624-9546.

4. **MAILING ADDRESS.** Complete endorsements will be sent to Intermountain Power Service Corporation as follows: Intermountain Power Service Corporation, Insurance Analyst, 850 West Brush Wellman Road, Delta, Utah 84624-9546.

5. **CLAIMS SHOULD BE REPORTED TO:**

Except as stated above nothing herein shall be held to waive, alter, or extend any of the limits, conditions, agreements, or exclusions of the policy to which this endorsement is attached.

I, (print/type name), warrant that I have authority to bind the below listed insurance company and by my signature hereon do so bind this company to this endorsement.

6. **SIGNATURE**
(Authorized Representative)
(Original signature required on copy furnished to Intermountain Power Service Corporation)

TITLE

7. **ORGANIZATION**

ADDRESS

TELEPHONE

---

8. TYPE OF COVERAGE **9. LIMITS OF LIABILITY** **10. POLICY PERIOD**
From:
To:

A Deductible of $
Self Insured Retention of $
Underlying Limits $
Applies _____ Per Claim _____ Per Occurrence

---

11. COVERAGE INCLUDES (check as applicable):
Waiver of Subrogation*

**Waiver of Subrogation - The company agrees to waive all rights of subrogation against Intermountain Power Agency, Intermountain Power Service Corporation, Los Angeles Department of Water and Power, and their officers, agents, and employees.*

12. OTHER PROVISIONS (use reverse side, if necessary)

13. NAMED INSURED AND ADDRESS:

14. INSURANCE COMPANY	15. POLICY NO.	16. ENDORSEMENT NO.	17. EFFECTIVE DATE

Rev 09/12/01 - ppb
S \CLRCOM\PERS\LCURTIS\ProfLiability

GENERAL LIABILITY – ADDITIONAL INSURED ENDORSEMENT
INTERMOUNTAIN POWER SERVICE CORPORATION

In consideration of the premium charged and not withstanding any inconsistent statement in the policy to which this endorsement is attached or any *endorsement now or hereafter attached thereto, it is agreed as follows:*

1. **ADDITIONAL INSUREDS.** Intermountain Power Agency, Intermountain Power Service Corporation, and Los Angeles Department of Water and Power, their officers, agents, and employees are included as insureds with regard to liability and defense of suits arising from the operations and uses performed by or on behalf of the Named Insured.

2. **CONTRIBUTION NOT PERMITTED.** Any other insurance maintained by the Intermountain Power Agency, Intermountain Power Service Corporation, and Los Angeles Department of Water and Power shall be in excess of this insurance and shall not contribute with it.

3. **SEVERABILITY OF INTEREST.** This insurance applies separately to each insured against whom claim is made or suit is brought except with respect to the insurer's limits of liability. The inclusion of any person or organization as an insured shall not affect any right which such person or organization would have as a claimant if not so included.

4. **CANCELLATION NOTICE.** With respect to the interests of Intermountain Power Service Corporation, this insurance shall not be canceled materially reduced in coverage or limits, or nonrenewed unless thirty (30) days prior written notice by receipted delivery is given to Intermountain Power Service Corporation address as follows: Intermountain Power Service Corporation, Insurance Analyst, 850 West Brush Wellman Road, Delta, Utah 84624-9546

5. **APPLICABILITY.** This insurance pertains to the operations and/or tenancy of the Named Insured under all written agreements in force with Intermountain Power Service Corporation unless checked here ___ in which case only the following specific agreements with Intermountain Power Service Corporation are covered:

6. **MAILING ADDRESS.** Complete endorsements will be sent to the Intermountain Power Service Corporation as follows: Intermountain Power Service Corporation, Insurance Analyst, 850 West Brush Wellman Road, Delta, Utah 84624-9546

7. **CLAIMS SHOULD BE REPORTED TO:**

Except as stated above nothing herein shall be held to waive, alter, or extend any of the limits, conditions, agreements, or exclusions of the policy to which the endorsement is attached.

I, (print/type name), warrant that I have authority to bind the below listed insurance *company and by my signature hereon do so bind this company to this endorsement*

8. **SIGNATURE** *(Authorized Representative)*
(Original signature required on copy furnished to Intermountain Power Service Corporation)

TITLE

9. **ORGANIZATION**

ADDRESS

TELEPHONE

10. COVERAGE INCLUDES (check as applicable):

___ Broad Form Property Damage
___ Personal Injury
___ Premises and Operations
___ Explosion Hazard
___ Collapse/Underground Hazard
___ Watercraft Liability
___ Contractual Liability
___ Owned Automobiles
___ Nonowned Automobiles
___ Hired Automobiles
___ Pollution
___ Garagekeeper's Legal Liability
___ Products/Comp. Ops. $ Aggregate
___ Independent Contractors $ Aggregate
___ Fire Legal Liability $ Sublimits
___ Incidental Medical Malpractice
___

11. TYPE OF COVERAGE

___ Occurrence ___ Claims Made-Retroactive Date

12. LIMITS OF LIABILITY
Occurrence $ Aggregate $

13. POLICY PERIOD
From: To:
Aggregate Specific To

14. ___ Deductible ___ Self-Insured Retention (check which) of $ applies to coverage
___ Per Claim ___ Per Occurrence ___ Limits Include Defense Costs
___ Deductible/Self Insured Retention Includes Defense Costs Discovery Period

15. OTHER PROVISIONS (use reverse side, if necessary)

16. NAMED INSURED AND ADDRESS:

17. INSURANCE COMPANY	18. POLICY NO.	19. ENDORSEMENT NO.	20. EFFECTIVE DATE OF ENDORSEMENT

Rev 09/12/01 - ppb
S:\CLRCOM\PERS\LCURTIS\GenLiability

AUTOMOBILE LIABILITY – ADDITIONAL INSURED ENDORSEMENT
INTERMOUNTAIN POWER SERVICE CORPORATION

In consideration of the premium charged and not withstanding any inconsistent statement in the policy to which this endorsement is attached or any endorsement now or hereafter attached thereto, it is agreed as follows:

1. **ADDITIONAL INSUREDS.** Intermountain Power Agency, Intermountain Power Service Corporation, Los Angeles Department of Water and Power, their officers, agents, and employees are included as insureds with regard to liability and defense of claims arising from the ownership, maintenance, or use of the insured vehicles being operated by or on behalf of the Named Insured.

2. **CONTRIBUTION NOT PERMITTED.** Any other insurance maintained by Intermountain Power Agency, Intermountain Power Service Corporation, and Los Angeles Department of Water and Power shall be in excess of this insurance and shall not contribute with it.

3. **SEVERABILITY OF INTEREST.** This insurance applies separately to each insured against whom claim is made or suit brought except with respect to the insurer's limits of liability. The inclusion of any person or organization as an insured shall not affect any right which such person or organization would have as a claimant if not so included.

4. **CANCELLATION NOTICE.** With respect to the interests of Intermountain Power Service Corporation, this insurance shall not be canceled, materially reduced in coverage or limits, or nonrenewed unless thirty (30) days prior written notice by receipted delivery is given to Intermountain Power Service Corporation addressed as follows: Intermountain Power Service Corporation, Insurance Analyst, 850 West Brush Wellman Road, Delta, Utah 84624-9546.

5. **APPLICABILITY.** This insurance pertains to the operations and/or tenancy of the Named Insured under all written agreements in force with Intermountain Power Service Corporation unless checked here ___ in which case only following specific agreements with Intermountain Power Service Corporation are covered:

6. **MAILING ADDRESS.** Complete endorsements will be sent to Intermountain Power Service Corporation as follows: Intermountain Power Service Corporation, Insurance Analyst, 850 West Brush Wellman Road, Delta, Utah 84624-9546.

7. **CLAIMS SHOULD BE REPORTED TO:**

Except as stated above nothing herein shall be held to waive, alter, or extend any of the limits, conditions, agreements, or exclusions of the policy to which this endorsement is attached.

I, (print/type name), warrant that I have authority to bind the below listed insurance company and by my signature here on do so bind this company to this endorsement.

8. **SIGNATURE** (Authorized Representative)
(Original signature required on copy furnished to Intermountain Power Service Corporation)

9. **ORGANIZATION**

ADDRESS

TITLE

TELEPHONE

---

10. TYPE OF COVERAGE **11. LIMITS OF LIABILITY** **12. POLICY PERIOD**
From:
To:

A Deductible of $
Self insured retention of $
Applies Per Claim
Per Occurrence
For
(which coverage)

---

13. COVERAGE INCLUDES (check as applicable):
Owned Automobile
Nonowned Automobile
Hired Automobile
Contractual Liability

---

14. OTHER PROVISIONS (use reverse side, if necessary)

---

15. NAMED INSURED AND ADDRESS:

16. INSURANCE COMPANY	17. POLICY NO.	18. ENDORSEMENT NO.	19. EFFECTIVE DATE OF ENDORSEMENT

Rev 09/10/01 - ppb
S \CLRCOM\PERS\LCURTIS\AutoLiability

WORKERS' COMPENSATION/EMPLOYER'S LIABILITY - SPECIAL ENDORSEMENT
INTERMOUNTAIN POWER SERVICE CORPORATION

In consideration of the premium charged and not withstanding any inconsistent statement in the policy to which this endorsement is attached or any endorsement now or hereafter attached thereto, it is agreed as follows:

1. **APPLICABILITY.** This insurance pertains to the operations and/or tenancy of the Named Insured under all written agreements in force with Intermountain Power Service Corporation unless checked here ___ in which case only following specific agreements with Intermountain Power Service Corporation are covered:

2. **CANCELLATION NOTICE.** With respect to the interests of Intermountain Power Service Corporation, this insurance shall not be canceled, materially reduced in coverage or limits, or nonrenewed unless thirty (30) days prior written notice by receipted delivery is given to Intermountain Power Service Corporation addressed as follows: Intermountain Power Service Corporation, Insurance Analyst, 850 West Brush Wellman Road, Delta, Utah 84624-9546.

3. **MAILING ADDRESS.** Completed endorsements will be sent to Intermountain Power Service Corporation address is as follows: Intermountain Power Service Corporation, Insurance Analyst, 850 West Brush Wellman Road, Delta, Utah 84624-9546.

Except as stated above nothing shall be held to waive, alter, or extend any of the limits, conditions, agreements, or exclusions of the policy to which this endorsement is attached.

I, (print/type name), warrant that I have authority to bind the below listed insurance company and by my signature hereon do so bind this company to this endorsement.

4. SIGNATURE
(Authorized Representative)
(Original signature required on copy furnished to Intermountain Power Service Corporation)

TITLE

5. ORGANIZATION

ADDRESS

TELEPHONE

6. TYPE OF COVERAGE	7. LIMITS OF LIABILITY	8. POLICY PERIOD	
WORKERS' COMPENSATION	STATUTORY	From:	To:
EMPLOYER'S LIABILITY	$		

9. COVERAGE INCLUDES (check as applicable):

Broad Form All State Endorsement	Jones Act
Voluntary Compensation Endorsement	Outer Continental Shelf Endorsement
United States Longshoremen and Harbor Workers Compensation Act	*Waiver of Subrogation**

*Waiver of Subrogation - The company agrees to waive all rights of subrogation against Intermountain Power Agency, Intermountain Power Service Corporation, Los Angeles Department of Water and Power, and their officers, agents, and employees.

10. OTHER PROVISIONS (use reverse side, if necessary)

11. NAMED INSURED AND ADDRESS:

12. INSURANCE COMPANY	13. POLICY NO.	14. ENDORSEMENT NO.	15. EFFECTIVE DATE OF ENDORSEMENT

Rev 09/10/01 - ppb
S \CLRCOM\PERS\LCURTIS\WorkCompLiability

From: "joel" <joel@advancedburner.com>
To: "Phil Hailes" <Phil-H@ipsc.com>
Date: 9/1/2003 8:04:01 AM
Subject: ABT Burner Proposal

Phil:

I wanted to add some information regarding the operation of the registers we ahve designed for your unit.

The designs we have used for other B&W boilers, such shown on the Pirkey dwgs we sent on Friday, use manual push-pull handles to move the sleeve damper(one handle0 and the outer adjustable spin vanes' bull ring(two handles). These are satisfactory for those registers, which are smaller than the one we have designed for you.

Because your's is larger and heavier, we will use ratchet type actuators to provide mechanical advantage for moving the sleeve damper and the spin vane ring.

These adjustments are normally only made when optimizing the burners and then remain in the same position for long periods of time. We have had good success in the long-term reliabilty of these devices.

I trust that the dwgs and information we sent on Friday plus this description will adequately present the operational considerations we have taken into account in designing these burners.

Joel Vatsky

CC: "Ferrara, Sal N." <Sal@advancedburner.com>, "Onaitis, Chuck" <Chuck@advancedburner.com>

From: "joel" <joel@advancedburner.com>
To: "Phil Hailes" <Phil-H@ipsc.com>
Date: 8/29/2003 2:55:46 PM

I tried sending this with the photo, but it's an 8MB file so I've deleted it. I'll try sending the photo seperately.

But if you will go to our website, advancedburner.com, you will see it in the low NOx burner section. We show two designs there, one has a rotating sleeve damper tha we no longer use and the other, further back in the test, shows the Pirkey burner.

Phil:

This is in responce to your conversation with Sal a little while ago.

I have attached a Power Point file that shows a side elevation of the burner for the 700MW Pirkey #1 unit's (owned by AEP/SWEPCo in Texas) burner as well as a photo of a complete assembly.

Also attached are two drawings for that job:

The burner field erection dwg shows the relationship between the various parts.

The air register throat assy dwg shows the register spin vanes and linkages in more detail.

The only difference, mechanically, between this burner and our latest version is that the inner fixed vane swirler was axially adjustable on Pirkey but we determined that we do not need that function to achieve the optimum performance of our burner. Consequently, the inner swirler is not adjustable on burners we have been offering recently. We have the non- movable design on a 700 MW unit with JEA in Florida and the burner functions fine; firing a mixturre of 80% Colombian coal and 20% petcoke(much more difficult fuel than yours).

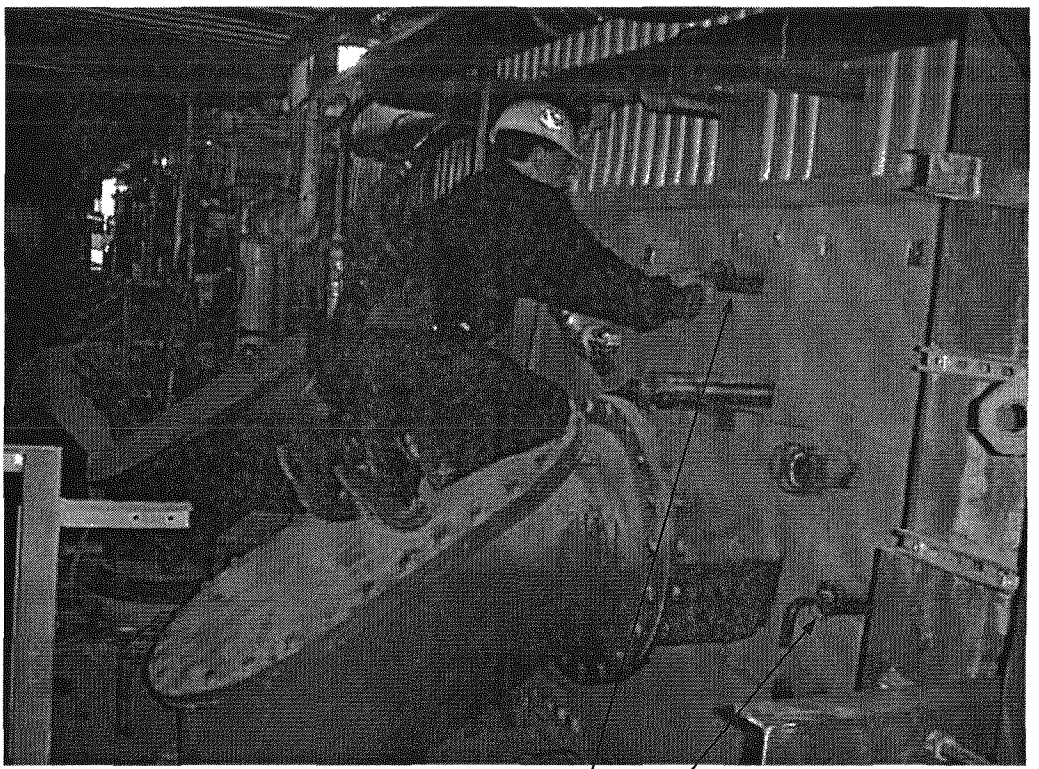
As far as making the throat assembly out of ceramic, we do not think this is a good idea. The tiles are fragile and can fracture due to impact, temperature gradient and mishandling. We have chosen SS castings because of their resistance to warping under high temperature and temp gradient conditions.

We have been using stainless steel castings made of the same material that our nozzles are. The longest they have been in service is at the Welsh #1 unit since 1999, also owned by AEP/SWEPCo in Texas, which is a 560 MW B&W boiler. Eight were also installed at Pirkey a year later(all 56 were done in fall '01). The throat castings look like new with no evidence of warping or cracking, or corrosion. They withstand the temperature and atmoshpere just fine.

We also have them installed on two other B&W units, firing bitminous coal, in Ky and there are no problems with those either.

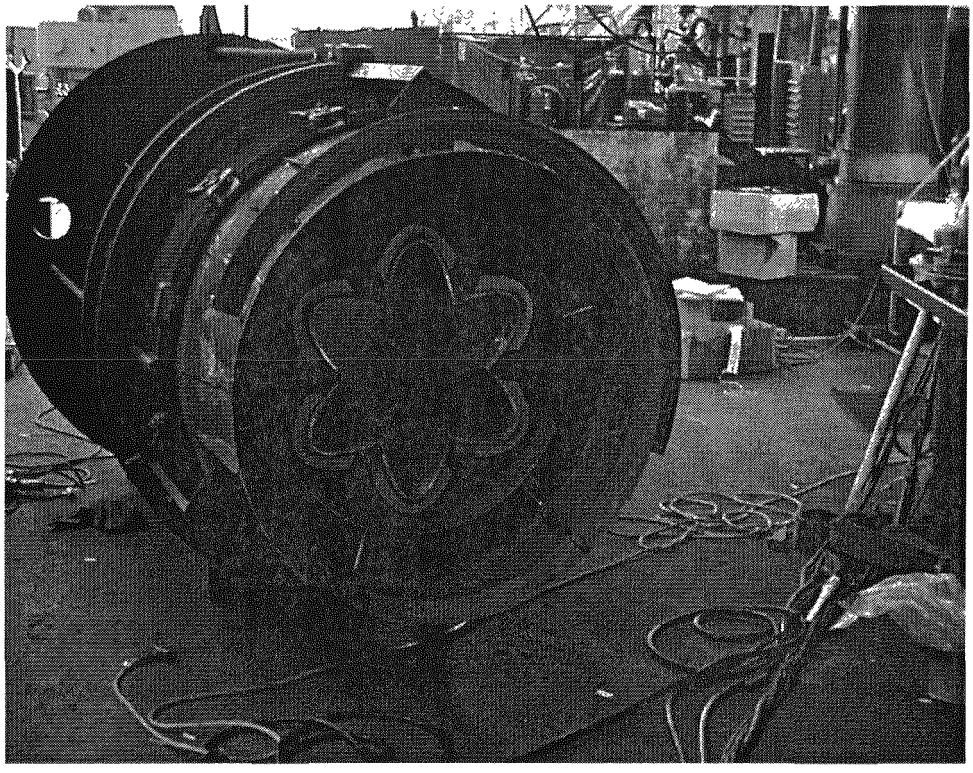
If you have any additional questions or need more detail please contact Sal.

Joel Vatsky



Pirkey#1: Adjusting the manual sleeve damper.

Outer spin vane adjustment handles(one of two)



Pirkey burner module prior to shipment and final cleanup.

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PART C - DIVISION C1

BIDDING DOCUMENTS

BIDDER'S BOND

(Not necessary when certified or cashier's check accompanies bid. See below*.)

SURETY BOND

We, the undersigned Principal and Surety, acknowledge ourselves jointly and severally bound to Intermountain Power Agency (IPA) and Intermountain Power Service Corporation (IPSC) of the state of Utah, and the City of Los Angeles Department of Water and Power (LADWP), in the sum of _____ Dollars ($_____), to be paid to IPA if the attached Proposal shall be accepted and the proposed Contract awarded to said bidder, and said bidder shall fail to execute the Contract and Bond for the faithful performance thereof; otherwise this obligation to be void.

Dated: August 22, 20 03

Firm Name: Advanced Burner Technologies Corp.

350 Main Street, Suite 5, Bedminster, NJ 07921NJ

By: _____
(Signature)**

(Surety): _____

By: _____
(Signature)

*When the bidder is submitting a check in lieu of a Bond, the check must be made payable to Intermountain Power Agency, must either be certified by a responsible bank or be a cashier's check issued by a responsible bank, and must be payable in the state of Utah.

If check is submitted herewith, state check number 16010201 and amount $50,000.00

**See Form, Signature, and Delivery of the Proposals, Division B1

NOTE: All signatures above must be written in ink.

PROPOSAL

The undersigned hereby proposes to furnish and deliver **Unit 2 Low NOx Burners** to the Intermountain Power Service Corporation in accordance with **Specifications 45606**.

The undersigned agrees, upon the acceptance of this Proposal: (a) to execute IPSC's form of Contract (including the Contract Agreement and other Contract Documents identified in said Specifications) for furnishing and delivering the items and services embraced in the accepted Proposal, (b) to perform its obligations under the Contract at the prices stated in the accompanying Proposal Schedule, and (c) to furnish a Performance Bond* conditioned upon the faithful performance of the Contract.

The undersigned furthermore agrees that, in case of failure to execute such Contract Agreement and provide the necessary Performance Bond, the check or Bidder's Bond accompanying this Proposal, and the monies payable thereon, shall be forfeited to and remain the property of Intermountain Power Agency.

The undersigned declares under penalty of perjury that this Proposal is genuine, is not a sham or collusive, and is not made in the interest or in behalf of any person or entity not herein named. The undersigned further declares under penalty of perjury that the bidder has not directly or indirectly induced or solicited any other bidder to submit a sham bid, or any other person, firm, or corporation to refrain from bidding. The undersigned also declares under penalty of perjury that the bidder has not in any manner sought by collusion to secure for itself an advantage over any other bidder.

I declare under penalty of perjury under the laws of the state of Utah that the foregoing is true and correct.

Date: August 22, 20 03

Bidder: Advanced Burner Technologies Corp.

Address: 350 Main Street, Suite 5

Bedminster, NJ 07921

Signed By: _____
(Authorized Signature)

Print Name: ~~Xxxxxxxxxxx~~ Sal Ferrara

Title: Director of Proposals & Projects

* 50% Performance Bond for construction 10% Retention for equipment performance.

PART C- DIVISION C2

BIDDING DOCUMENTS - PROPOSAL SCHEDULE

1. Proposal is hereby made to furnish and deliver to IPSC **Unit 2 Low NOx Burners**, F.O.B. IPSC dock, full freight allowed in accordance with **Specifications 45606**, the following:

   a. Burner and Scanner Performance: The new burners shall provide for a continuous boiler operation of 6,900,000 pounds/hour output, 1,005°F superheat and 1,005°F reheat temperature under all operating conditions. Bidders shall state the following burner and scanner performance guarantees and submit with the bid package:

BURNER AND SCANNER PERFORMANCE GUARANTEES	
Maximum Burner Nox and CO Production Under All Modes of Operation:	NOx=0.33 lb/mbtu CO=200 ppm
Maximum Burner BTU Throughput:	> 220 MBtu/hr
Burner and Scanner System Temperature Tolerance and Thermal Degradation Life:	Burner Tip=2000°F Scanner Electronic=140°F
Time Within Which Burner Register Assembly Shall Remain Fully Operable By Hand:	Past Guarantee Period
Combustion Zone Stability (Ignition Location/Stability, Flame Shape/Color):	Bright Flame in throat
Ash Deposition (At Burner Throat, OFA Ports, and Superheat Pendants:	Burner Throats & SH No add'l from current
Maximum Burner Out-Of-Service Cooling Air Requirements (CFM Per Compartment):	Scanners= 15 SCFM at 10"W.C.
Minimum In-Service Air Flow With Associated Emissions (Assuming 10 Percent Total Overfire Air Flow):	See Proposal Sec. 4
Maximum In-Service Air Flow With Associated Emissions (Assuming 10 Percent Total Overfire Air Flow):	See Proposal Sec. 4
Maximum Wear Life of Primary Air/Coal Path Components (Minimum Four (4) Years):	Nozzles: 6-8 yrs.+ Fuel Dist. 4-6 yrs. +

b. In support of the stated guarantees, the bidder shall provide clear commitments in the following areas:

CLEAR COMMITMENTS
The Nature of Remedial Efforts That Will Occur to Achieve Guaranteed Performance in Each Area
The Approximate or Typical Time Frame Associated with Resolution of Each of the Stated Performance Guarantees
The Company or Organization Expected to Provide the Applicable Resources Associated with the Remedial Work (Modifications, Testing, and Operational)
The Ultimate Monetary Compensation Offered by the Original Equipment Manufacturer (OEM)

2. Prices: The price or prices shall be according to the following bid pricing sheet:

BID PRICING SHEET	
Bid Price to Purchase Forty-Eight (48) Low NOx Burners, Per Specifications, Without Scanners:	$ 2,237,415.00
Bid Price to Purchase Forty-Eight (48) Scanners and Ancillary Hardware, Per Specifications:	ABB 55,385 $ 157,130.00
Bid Price to Install Forty-Eight (48) Burners and Associated Flame Detection Systems:	212,515 $ 1,473,130.00
TOTAL BID PRICE:	$ 3,867,675.00

3. Cash Terms: A discount for prompt payment is offered of 0% percent for Contract payments made within 30 calendar days after date of acceptance or delivery and receipt of invoice.

4. Taxes: The foregoing quoted prices are exclusive of all applicable sales and use taxes.

5. Manufacturer: Advanced Burner Technologies and IRIS or ABB (option)

6. Location of Point of Manufacture: USA

7. Brand and Catalog Number or Other Designation: OPTI-FLOW™ Low NOx Burner, IR-P532/S552 or Safeflame™ DFS

8. Form of Business Organization: The bidder shall state below the form of its business organization.

9. Bidder is a: Corporation, organized under the laws of the state of NJ. (Corporation, Partnership, Limited Partnership, Individual)

If a partnership, the bidder shall state below the names of the partners. If a corporation, the bidder shall state below the names of the president and of the secretary.

10. Person to Contact: Should IPSC desire information concerning this Proposal, please contact:

Name: Sal Ferrara Telephone No: 908-470-0721

Address: 350 Main Street, Suite 5, Bedminster, NJ 07921

(If different, the address of bidder's chief executive office is:)

PART C - DIVISION C3

BIDDING DOCUMENTS - ADDITIONAL BID INFORMATION

1. Bid Submittal Requirements: Information supplied in submittals shall include, but not be limited to, the following:

   a. Schedule showing the cost of replacement parts for both the burner components and the flame detection system, including a pricing index for calculating cost of individual replacement parts through the year 2010.

   b. A recommended spare parts list with current pricing and normal delivery schedule.

   c. Location, name, and telephone number of the nearest service technicians for both burners, burner instrumentation, and the flame detection systems.

   d. Analysis of fail-safe modes of operation of the flame detection system, including component self-diagnostics and alarming.

   e. Dimensional drawings as required for bid analysis and evaluation.

   f. Burner and lighter materials of construction and applicable temperature tolerance.

   g. Environmental limitations of burner and scanner hardware, including both airborne contaminants and heat.

   h. Available and recommended modes of operation for both the flame dectection system and the burner system.

   i. Recommended maintenance requirements for the burners and flame detection system.

   j. Required boiler modifications for accommodation of the new hardware.

   k. Installation and performance history of the burners and flame detection system.

   l. Recommended spare parts for all hardware or software provided.

   m. Proposed installation plan, including recommended methods of installation for maximizing both installation productivity and operating reliability.

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Executive Summary and Philosophy

Advanced Burner Technologies Corporation is pleased to offer this proposal to Intermountain Power Service Corporation to supply and install state-of-the-art low NO_x burners for the Delta Unit #2 boiler. The specification lists several western bituminous coals, none of which, either singly or in the combinations specified, present any problem for ABT. The NO_x guarantee is 0.33 lb/MBtu is based upon what we understand to be the worst coal, SUFCO, which currently yields NO_x of about 0.45. Consequently, the NO_x will be reduced by at least 25% under equivalent operating conditions: 15% excess air and no overfire air flow. With 10% OFA flow, NO_x will be reduced to about 0.29 and with 20% to <0.25.

NO_x = .33 @ 0% OFA
NO_x = .29 @ 10% OFA
NO_x < .25 @ 20% OFA

These values are based upon actual field experience with boilers of various sizes firing fuels ranging from lignite to PRB to eastern and western bituminous coal, as well as bit/PRB mixtures; and equipped with ABT's low NO_x burners only or these burners plus our OFA system. Consequently, we have a very high degree of confidence that these values can be attained in operation at Delta #2.

Under contract to ABT, Airflow Sciences Corporation will perform CFD models of the windboxes. This will enable us to optimize the secondary air distributions within the compartmented windbox design.

This proposal includes complete mechanical and electrical installation of all ABT supplied equipment. ABT's installation partner is Maintenance Enterprises, Inc., whose General Manager, Mike Simonds, has worked with ABT on several low NO_x conversions. These conversions include the turn-key supply and installation of low NO_x burners and overfire air systems at two 540 MW Kentucky Utilities boilers and installation of our burners on another 500MW unit at Deseret Generation & Transmission Coop in Vernal Utah. MEI, under Mr. Simonds' direction, will do an exemplary job of installing the ABT equipment.

We have the utmost confidence that the guarantees we have offered will be met.

Joel Vatsky, President
Advanced Burner Technologies Corp

1.0 Introduction

1.1 Background

Intermountain Power Service Corporation (IPSC) Unit 2 is a B&W pulverized coal, supercritical boiler rated at 6,900,000 pounds of steam per hour. This unit fires western bituminous coal using 48 OEM dual register low NO_x burners. NO_x emissions typically range between 0.4 and 0.45 lb/10^6 Btu at full load as a function of coal source, with one mill out of service.

Advanced Burner Technologies (ABT) has developed a novel, highly effective low NO_x burner that has demonstrated NO_x levels in the 0.35 – 0.40 range on several large boilers firing bituminous coals, including western coal. Approximately 10,000 MW of large utility boilers have been converted to ABT's Opti-Flow™ burner design. These units range in capacity from 70 to 720 MW. In addition, ABT has implemented a novel OFA system along with its low NO_x burner, to obtain minimum NO_x without performance or operational problems. Fuels range from lignite to high sulfur bituminous coal.

Intermountain Unit 2 has a moderate burner zone liberation rate (BZLR) of approximately 300,000 Btu/hr-ft^2. For this furnace burning western bituminous coal, ABT would expect operating NO_x levels at full load to be in the range of 0.30 - 0.35 lb/10^6 Btu with a retrofit of 48 Opti-Flow™ low NO_x burners and one mill out of service; with overfire air port closed.

1.2 NO_x Control Philosophy

Advanced Burner Technologies utilizes the following considerations for attaining minimum NO_x levels while minimizing the potential for adverse furnace effects.

1. Utilize a highly effective low NO_x burner that achieves minimum NO_x emissions without overfire air.

2. Balance coal flows to the burners to eliminate very high coal flow regions that generate high LOI and CO, and very low coal flow regions that generate high NO_x.

3. Eliminate poor windbox distribution of secondary air caused by stratifications and recirculation zones that exacerbate the burner balancing problems caused by poor coal line distribution.

Note: It is ABT's experience that minimum NO_x, CO and LOI cannot be attained without addressing the fuel and air imbalances that exist in most boilers.

NO_x is generated by two different processes; fuel bound nitrogen and thermal NO_x. Thermal NO_x formation is promoted by high furnace temperatures (i.e. BZLR), which convert atmospheric nitrogen to NO_x. Intermountain Unit 2 has a moderate BZLR and

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thermal NO_x generation is an issue, with this furnace heat release. However, the ABT Opti-Flow™ fuel injector produces a flame that efficiently reduces fuel bound nitrogen compounds to N_2, as well as minimizing thermal NO_x formation. The Technical Discussion section contains a more complete discussion of the furnace parameters and its relationship to NO_x.

1.3 Opti-Flow™ Low NO_x Burner

The heart of the Opti-Flow™ low NO_x burner is a fuel injector that improves reliability and performance as compared to more conventional fuel injectors. The combination of the new fuel injector and a suitable low NO_x dual register, results in a low NO_x burner that attains at least 35 percent lower NO_x levels than the conventional designs of low NO_x burners it has replaced.

The Opti-Flow™ low NO_x, flame stabilization nozzle is the key element of the fuel injector for attaining excellent flame stability along with minimum NO_x. Excellent flame stability is achieved due to external flame stabilizers surrounding each segment. Nearly uniform fuel distribution around the burner nozzle circumference is obtained, which provides significant aid in attaining minimum NO_x and UBC simultaneously.

Advanced Burner Technologies utilizes high quality stainless steels for all parts of the fuel injector that face the furnace, as well as stainless steel castings for all complex parts. The result is high reliability and excellent longevity of the burners.

ABT's Opti-Flow™ dual register is an innovative design that provides the operator with the flexibility of optimizing: inner and outer zone swirl values and the air flow split between the inner and outer zones independently of swirl. This is accomplished with a manually adjustable inner air damper and represents a significant improvement over other dual register designs. A fixed vane swirler is fixed to the outer barrel of the fuel injector to impart swirl to the inner air zone.

1.4 Analytical Evaluations

CFD (Computational Fluid Dynamics) is an analytical tool that aids in the design of air delivery systems. CFD allows us to evaluate alternatives and provide an optimized system without modifying the system after installation. Air supply systems in a boiler are so complex it is impossible to optimize a system using conventional duct design techniques. Consequently CFD analysis is utilized for the following:

- Optimize air flow distribution to the burners within the existing wind-boxes.
- Minimize pressure loss in ducts

For Intermountain Unit 2, a primary area of investigation is CFD modeling of the wind-box air flow. Airflow Sciences Corporation (ASC) will develop a model of the wind-box and secondary air ducts, in order to evaluate the air flow distribution to the

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burners within the windboxes and the air flow to each individual burner. The results will be used to design any turning vanes, baffles or other distribution devices to improve air flow within the ducts and windboxes.

Note, that this B&W boiler uses compartmented windboxes that do not act as true plenums. Consequently, secondary air flow is not uniformly distributed to the burners within the windbox; and it has been ABT's experience that these windbox flows can be unstable.

ABT has a means of eliminating the instability and minimizing burner-to-burner secondary air imbalances by converting each compartment into a nearly true plenum. The cost for this is very moderate and it's effectiveness has been shown in the field on a 560 MW B&W boiler.

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2.0 Technical Discussion

The NO_x emission from any given boiler is a function of several variables:

- Furnace size relative to full load heat input: The larger the furnace for a given heat input, the lower the temperatures will be. Therefore, thermal NO_x will be lower. This parameter, Burner Zone Liberation Rate, is expressed as Q/BZS.

- Fuel Parameters: The fuel constituents which have the largest impact on NO_x are N_2, HHV, and FC/VM.

- Burner Design: The design of the burner produces the largest effect on both combustion and NO_x emissions. Very low NO_x levels can only be attained with a highly effective low NO_x burner.

To determine the NO_x level a boiler is capable of generating with a given low NO_x burner, a comparison is made of that boiler with a unit that has similar BZLR, fuel parameters, and the same burner design.

2.1 Boiler Comparisons and ABT Experience

Burner Zone Liberation Rate (BZLR) is the ratio of heat input to the furnace (Q) to the Burner Zone Surface (BZS). The following calculation of BZLR is summarized below:

$Q = w_f [HHV + (\# air / \# fuel) (0.248) (T_a - 80)]$

Where: w_f = fuel flow (lb/hr) and T_a = secondary air temperature

$BZS = 2 (WD + WH + HD)$

(The BZS is the six-sided box that surrounds the burners.)

Where: W = unit width, D = unit depth, H = wall height from the hopper knuckle to 10' above the top burner level.

For Intermountain, using the design coal analysis:

$Q = 9038 \times 10^6$ Btu/hr

$BZS = 29{,}566\ ft^2$

$BZLR = Q/BZS = 305{,}700\ Btu/hr/ft^2$

ABT considers NO_x emissions of 0.30 - 0.35 lb/10^6 Btu with western bituminous coal to be attainable with the Opti-Flow™ low NO_x burner, with OFA ports closed. Our

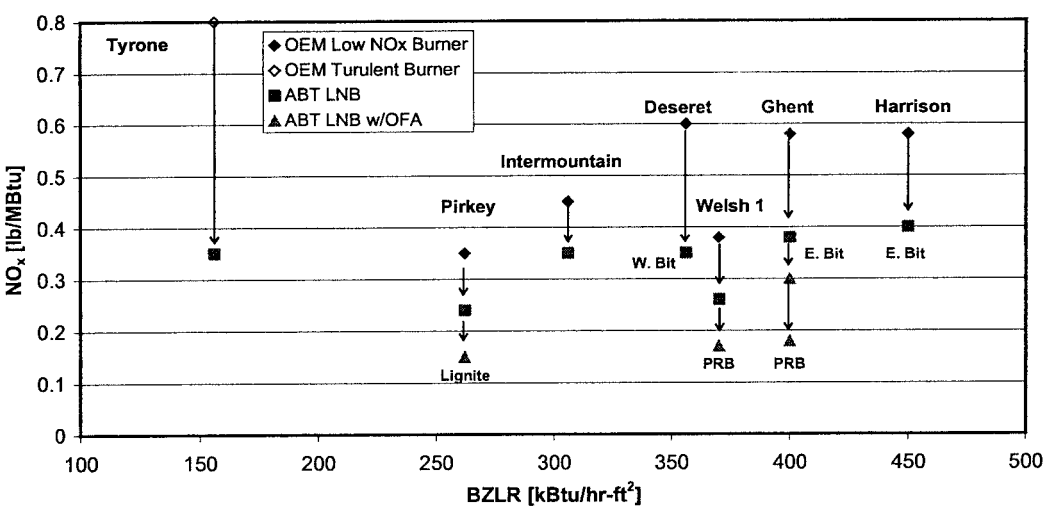
experience with the Opti-Flow™ burner on a boiler with similar BZLR firing western bituminous coal has demonstrated that a NO_x level of 0.35 lb/10^6 Btu is attainable.

Figure 2-1 compares NO_x levels as a function of BZLR for several cases:

a) OEM low NO_x burners (B&W and Foster Wheeler) firing bituminous coal for three (3) boilers. The data indicate that there is little difference between the B&W and FW low NO_x burners of that early vintage.

b) Data for Deseret Bonanza Unit one which has a BZLR similar to that for Intermountain. In addition, this boiler fires a western bituminous coal with characteristics similar to the coal(s) fired at Intermountain.

Figure 2.1 Low NOx Burner Comparison
NO_x vs. Burner Zone Liberation Rate



Shown in Figure 2-1 is data for the following six boilers firing lignite, PRB and bituminous coal:

Deseret, Bonanza Unit 1: A 440 MW Foster Wheeler boiler, firing western bituminous coal similar to the worst Intermountain coal, was retrofitted in May 1997 with 20 Opti-Flow low NO_x burners. NO_x emissions before the retrofit, with the original Foster Wheeler low NO_x burners, were typically in the 0.55 to 0.6 range. After the retrofit, with the ABT low NO_x fuel injectors and dual register modifications, NO_x is approximately 0.35. In 2001, three of the five mills were replaced with larger units and the new mill's burners were upgraded to handle the higher capacity. The boiler now produces 500 MW with no increase in NO_x or detrimental impacts to boiler performance. Burner coking and fires have been eliminated, as have burner eyebrows and furnace slag.

Deseret Contact: Dan Howell 435-781-5718

AEP/SWEPCO, Welsh #1: A 560 MW B&W boiler with 42 burners (NO_x with OEM dual register low NO_x burners was ~0.38). Unit was retrofitted with ABT Opti-Flow Mark I burners in the fall of 1999; initially no OFA ports were installed. Operating with one top burner deck out of service, NO_x was typically in the 0.20 to 0.22 range.

In the fall of 2001, ABT's OFA system was installed at Welsh #1. With the OFA ports open, NO_x has been reduced to the 0.16 – 0.17 range with all mills in service. It is apparent that significant coal line imbalances exist at Welsh #1; these imbalances limit the degree of NO_x reduction that can be achieved, since they result in high CO emissions. Although the unit was designed for operation with 19% excess air, it must currently operate with approximately 25% excess air in order to control CO. Minimizing these coal line imbalances will allow operation at near design excess O_2 or below and reduce the NO_x to the 0.15 level.

AEP/SWEPCO, Pirkey #1: A 700 MW B&W boiler firing Texas lignite (NO_x with OEM dual register low NO_x burners was ~ 0.36 to 0.38). The unit was completely retrofitted with 56 ABT Opti-Flow Mark II Low NO_x burners and OFA system in the fall of 2001. NO_x emissions, with the OFA ports closed, have been lowered to approximately 0.22. Operation of the OFA system has been very successful in that the boiler can operate continuously at full load with NO_x emissions of ~ 0.15 lb/10^6 Btu with one mill out of service (normal operation).

AEP Contact: Kent Randall 318-673-3813 Welsh & Pirkey Plants

Kentucky Utilities, Ghent #3 and #4: Two 540 MW FW boilers firing Kentucky bituminous coal. NO_x emissions of 0.55 to 0.7 without OFA and about 0.45 with OFA ports open were attained with the OEM low NO_x burners and OFA system. ABT replaced all 24 fuel injectors, with the Opti-Flow Mark I design, upgraded the FW dual registers and supplied a new OFA system to each boiler. Unit #3 was converted in the fall of 1998 and Unit #4 in the fall of 1999. NO_x was reduced to about 0.40 while firing Eastern bituminous coal and 0.23 for PRB coal, with OFA ports closed; and to 0.3 and 0.18 respectively with OFA ports open. Currently, NOx is about 0.3 firing a 50/50 blend of E. bituminous and PRB with OFA ports closed.

The walls of these boilers are coated with refractory to maintain furnace temperatures and to attain design steam temperatures (low steam temperatures resulted from an OEM boiler design problem). Prior to the retrofit, there were frequent heavy slag falls from the walls; however not a single slag fall has been observed following the retrofit.

Ghent Contact: Steve Nix 502-347-4152

Allegheny Energy, Harrison #1, 2 and 3: Three 660 MW FW boilers that are of pre-NSPS design with very hot, tight furnaces firing a highly slagging, eastern bituminous coal. All units were upgraded by replacing the fuel injector with the ABT design, while maintaining the existing FW dual registers. NO_x emissions have been reduced from the 0.55 to 0.6 range to below 0.45 without overfire air. The furnaces are clean

with no evidence of any operating or performance problems, due to the new low NO_x burners. Unburned carbon is in the same range as before the retrofit.

Harrison Contact: Dean Hedrick 304-584-2350

Tyrone Unit#3/ Green River Unit #3: These are 70 MW B&W boilers each originally with eight turbulent burners firing Eastern bituminous coal. Tyrone was started up in fall 2001 and Green River in spring 2002.
NO_x has been reduced from about 0.8 to below 0.35 lb/10^6 Btu without OFA. There was no increase in UBC and no deterioration in boiler performance or efficiency.

Tyrone Contact: Tom Moore 859-879-3501
Geen River Contact: Tom Troost 270-757-3113

JEA St. John Unit #1: A 660 MW Foster Wheeler boiler that fires a blend containing 20% petroleum coke and 80% bituminous coal with 28 burners; more petroleum coke is fired in this boiler than any other pulverized coal boiler in the U.S. In addition, Colombian coal is fired in this blend, which makes it an even more difficult fuel since this coal is commonly known to be difficult to burn.

In early 2003, St. Johns Unit 1 was completely retrofitted with 28 Opti-Flow™ LNB's and similar windbox/secondary air modifications. Preliminary burner tuning has shown that NO_x has been reduced by over 20% for Unit 1; further reduction in NO_x is anticipated once additional burner tuning is completed.

Excellent flame stability has also been attained with the retrofit of Opti-Flow™ burners for Unit 1. In fact, the petroleum coke blend can now be fired in the lower rows of burners without flame stability problems. Excellent flame stability is also maintained as load is reduced from 670 MW to 380 MW, with only one mill out of service (normal operating practice with these boilers). Prior to the retrofit of Opti-Flow™ burners, this turndown could not be achieved with only one mill out of service. To date, ABT is the first to demonstrate the ability to cofire petroleum coke in a wall-fired boiler with an advanced low NO_x burner that maintains such excellent flame stability and NO_x reduction.

St. Johns Contact: Bob Branning 904-665-8806

Of particular note from the data shown in Figure 2-1 are the following:

- **Opti-Flow™ low NO_x burners result in a relatively flat BZLR curve by minimizing thermal NO_x formation.**
- **At the high BZLR values of Deseret, Ghent, and Harrison, the Opti-Flow™ burner NO_x level is at least 35% lower than the OEM's low NO_x burners.**

AEP/SWEPCO, Welsh #1: A 560 MW B&W boiler with 42 burners (NO_x with OEM dual register low NO_x burners was ~0.38). Unit was retrofitted with ABT Opti-Flow Mark I burners in the fall of 1999; initially no OFA ports were installed. Operating with one top burner deck out of service, NO_x was typically in the 0.20 to 0.22 range.

In the fall of 2001, ABT's OFA system was installed at Welsh #1. With the OFA ports open, NO_x has been reduced to the 0.16 – 0.17 range with all mills in service. It is apparent that significant coal line imbalances exist at Welsh #1; these imbalances limit the degree of NO_x reduction that can be achieved, since they result in high CO emissions. Although the unit was designed for operation with 19% excess air, it must currently operate with approximately 25% excess air in order to control CO. Minimizing these coal line imbalances will allow operation at near design excess O_2 or below and reduce the NO_x to the 0.15 level.

AEP/SWEPCO, Pirkey #1: A 700 MW B&W boiler firing Texas lignite (NO_x with OEM dual register low NO_x burners was ~ 0.36 to 0.38). The unit was completely retrofitted with 56 ABT Opti-Flow Mark II Low NO_x burners and OFA system in the fall of 2001. NO_x emissions, with the OFA ports closed, have been lowered to approximately 0.22. Operation of the OFA system has been very successful in that the boiler can operate continuously at full load with NO_x emissions of ~ 0.15 lb/10^6 Btu with one mill out of service (normal operation).

AEP Contact: Kent Randall 318-673-3813 Welsh & Pirkey Plants

Kentucky Utilities, Ghent #3 and #4: Two 540 MW FW boilers firing Kentucky bituminous coal. NO_x emissions of 0.55 to 0.7 without OFA and about 0.45 with OFA ports open were attained with the OEM low NO_x burners and OFA system. ABT replaced all 24 fuel injectors, with the Opti-Flow Mark I design, upgraded the FW dual registers and supplied a new OFA system to each boiler. Unit #3 was converted in the fall of 1998 and Unit #4 in the fall of 1999. NO_x was reduced to about 0.40 while firing Eastern bituminous coal and 0.23 for PRB coal, with OFA ports closed; and to 0.3 and 0.18 respectively with OFA ports open. Currently, NOx is about 0.3 firing a 50/50 blend of E. bituminous and PRB with OFA ports closed.

The walls of these boilers are coated with refractory to maintain furnace temperatures and to attain design steam temperatures (low steam temperatures resulted from an OEM boiler design problem). Prior to the retrofit, there were frequent heavy slag falls from the walls; however not a single slag fall has been observed following the retrofit.

Ghent Contact: Steve Nix 502-347-4152

Allegheny Energy, Harrison #1, 2 and 3: Three 660 MW FW boilers that are of pre-NSPS design with very hot, tight furnaces firing a highly slagging, eastern bituminous coal. All units were upgraded by replacing the fuel injector with the ABT design, while maintaining the existing FW dual registers. NO_x emissions have been reduced from the 0.55 to 0.6 range to below 0.45 without overfire air. The furnaces are clean

with no evidence of any operating or performance problems, due to the new low NO_x burners. Unburned carbon is in the same range as before the retrofit.

Harrison Contact: Dean Hedrick 304-584-2350

Tyrone Unit#3/ Green River Unit #3: These are 70 MW B&W boilers each originally with eight turbulent burners firing Eastern bituminous coal. Tyrone was started up in fall 2001 and Green River in spring 2002.
NO_x has been reduced from about 0.8 to below 0.35 lb/10^6 Btu without OFA. There was no increase in UBC and no deterioration in boiler performance or efficiency.

Tyrone Contact: Tom Moore 859-879-3501
Geen River Contact: Tom Troost 270-757-3113

changed barrels only scroll.

Florida

JEA St. John Unit #1: A 660 MW Foster Wheeler boiler that fires a blend containing 20% petroleum coke and 80% bituminous coal with 28 burners; more petroleum coke is fired in this boiler than any other pulverized coal boiler in the U.S. In addition, Colombian coal is fired in this blend, which makes it an even more difficult fuel since this coal is commonly known to be difficult to burn.

8 burners
Windbox Changes
No guarantees.
.5 limit

In early 2003, St. Johns Unit 1 was completely retrofitted with 28 Opti-Flow™ LNB's and similar windbox/secondary air modifications. Preliminary burner tuning has shown that NO_x has been reduced by over 20% for Unit 1; further reduction in NO_x is anticipated once additional burner tuning is completed.

"CFD"

Excellent flame stability has also been attained with the retrofit of Opti-Flow™ burners for Unit 1. In fact, the petroleum coke blend can now be fired in the lower rows of burners without flame stability problems. Excellent flame stability is also maintained as load is reduced from 670 MW to 380 MW, with only one mill out of service (normal operating practice with these boilers). Prior to the retrofit of Opti-Flow™ burners, this turndown could not be achieved with only one mill out of service. To date, ABT is the first to demonstrate the ability to cofire petroleum coke in a wall-fired boiler with an advanced low NO_x burner that maintains such excellent flame stability and NO_x reduction.

"Very stable flames"

St. Johns Contact: Bob Branning 904-665-8806
Sr. Plant Engineer

Of particular note from the data shown in Figure 2-1 are the following:

- **Opti-Flow™ low NO_x burners result in a relatively flat BZLR curve by minimizing thermal NO_x formation.**
- **At the high BZLR values of Deseret, Ghent, and Harrison, the Opti-Flow™ burner NO_x level is at least 35% lower than the OEM's low NO_x burners.**

- **NO_x shows only a slight dependence on BZLR for boilers with ABT low NO_x burners. The BZLR for Intermountain is similar to Deseret, which show NO_x emissions of 0.35. This data indicates that a NO_x level of 0.33 is attainable for Intermountain at 15% excess air and OFA ports closed.**

2.2 Opti-Flow™ Low NO_x Burner:

ABT's Opti-Flow™ low NO_x burner generates a very bright, intense flame that does not look like the classical low NO_x flame: its intensity is more akin to that of classical turbulent burners. Yet, the NO_x levels are typically more than 35 percent lower than those generated by competitors' low NO_x burners that ABT has replaced firing bituminous coal and more than 40% lower than those firing PRB. This NO_x reduction result has been attained without any additional UBC penalty.

The Opti-Flow™ low NO_x, flame stabilization nozzle is the key element of the fuel injector for attaining excellent flame stability along with minimum NO_x. Excellent flame stability is achieved by incorporating external flame stabilizers surrounding each nozzle segment. The segmented coal nozzle has an open design with no obstructions to wear or to collect coal. Nearly uniform fuel distribution around the burner nozzle circumference is also obtained, which provides significant aid in attaining minimum NO_x and UBC simultaneously. Pressure drop is minimal and there are no components in the coal path that would be subject to wear, coal accumulation, or coking.

Advanced Burner Technologies utilizes high quality stainless steels for all parts of the fuel injector that face the furnace, as well as stainless steel castings for all complex parts. The result is high reliability and excellent longevity of the burners.

ABT's Opti-Flow™ dual register is an innovative design that provides the operator with the flexibility of optimizing inner and outer zone swirl values, and the air flow split between the inner and outer zones independently of swirl. This is accomplished with a manually adjustable inner air damper and represents a significant improvement over other dual register designs. A fixed vane swirler is attached to the outer barrel of the fuel injector to impart swirl to the inner air zone.
In order to be most effective, any low NO_x burner must operate in an external environment that provides proper conditions needed for optimal combustion at each burner. There are two operational areas that are extremely important for best burner performance with minimum flame length:

a) Known and accurately controlled primary air flow along with other sources of air which enter the fuel injector: such as auxiliary air and seal air. ABT has sized the fuel injector proposed here based on the PA flow contained in the OEM mill curves for Intermountain Unit 2. This primary air flow must be verified during pre-retrofit testing.

b) PA/coal flows between burners must be as balanced as possible. Significant imbalances in either PA or coal flows will yield:

- Longer flames on some burners.
- High NO_x from the burner with low fuel flow
- High UBC from the burner with high fuel flow
- High windbox pressure caused by an attempt to force an excessive amount of air to the high fuel burners.

This problem is generated by both unequal coal pipe lengths (resistance) and external mill stratifications. ABT's experience is that the proper use of adjustable coal pipe orifices can alleviate this problem to a considerable degree.

2.2.1 Fuel Injector for Intermountain Unit 2

The key components of the fuel injector include:

a) Fuel Distribution System: Flow enhancing fuel distribution system yields nearly uniform coal distribution at the burner nozzle. Uniform coal distribution helps to minimize NO_x and prevent significant increase in unburned carbon. This will be shop installed into the existing ceramic lined sweep elbows.

b) Low NO_x Opti-Flow™ Segmented Burner Tip: Cast stainless steel open coal nozzle with integral external flame stabilizers promotes internal fuel staging reactions which result in minimum NO_x, yet provide extremely stable, bright flames.

2.2.2 New ABT Opti-Flow Dual Registers with Fuel Injector

ABT's complete dual register, described in detail in Section 7, will be installed in combination with our fuel injector. The improvements in air flow control and operability will amplify the fuel injector's ability to control NO_x. Minimum NO_x with optimal flame shape should then be attainable. The ABT dual register design provides the following:

- Optimized secondary air flow to the burners (nearly equal total air/coal ratios) accomplished by adjustment of individual burner dampers.

- Independent control of secondary air swirls and flow distribution within the burner.

2.3 Analytical Evaluations

Airflow Sciences Corp (ASC) will develop a CFD model of Intermountain's burner windboxes and duct work. ABT's experience is that the B&W compartmented

windboxes, with air flow control by louvered dampers, is inherently unstable. This modeling will identify regions where turning vanes and baffles will be needed to optimize flow to the burners, while minimizing pressure drop.

2.4 Testing

IPSC will contract the following testing and analytical services that will be witnessed by ABT's service personnel:

- Pre-retrofit testing will be conducted within three weeks following contract award to verify the primary air flow to the inlet of all of the mills. These tests will be conducted with one mill out of service and three mill loads: maximum, 70% and 40%. Maximum mill load corresponds to boiler full load with one mill out of service.

  Isokinetic coal samples will be taken to evaluate the coal pipe balance. Those mills that have balance worse than ±10% from the mean will need to be balanced.

- A short boiler Baseline Test program will be performed in order to develop baseline data. Emissions and boiler performance data will be taken over the control range of the boiler with all mills in service.

- Emissions testing will be conducted immediately following start-up of the new combustion system. If not currently installed, during the outage the plant should install taps in the flue, upstream of the air heater. Probes will be placed in each tap for a complete grid. NO_x, O_2, and CO will be sampled during the start-up and burner optimization period after the outage. Unburned carbon will be sampled in the same manner as done for the baseline. Start-up, optimization and operational testing are expected to take no more than four weeks.

2.5 ABT Support Personnel

Lead ABT personnel, having > 20 years experience, that would support the Intermountain project are:

Name	Location	Phone No.
George Schiazza-Lead Service Engineer	Jacksonville, FL	904-272-8923
Tarkel Larson-Service & Sales Manager	Chattanooga, TN	423-899-8918
Sal Ferrara-Proposal & Project Manager	Bedminster, NJ	908-470-0721
Chuck Onaitis-Engineering Manager	Bedminster, NJ	908-470-0722

IP7_031074

3.0 Scope of Supply

Following is the scope of supply offered by ABT for the project.

3.1 Opti-Flow™ Low NO_x Burners

Forty-eight (48) Opti-Flow™ low NO_x burner modules with the following features.

- ABT's fuel distribution system consisting of silicon carbide and ceramic tile-lined components that will be installed in the existing ceramic tile-lined sweep elbow.
- A straight fuel injector with a cast HE tip for thermal resistance and long life.
- An inner air zone with a manually operated sliding damper for inner versus outer air flow distribution control and a stationary fixed vane spinner.
- A manually operated sleeve damper for total burner secondary air flow control and burner air flow balancing.
- Manually operated outer zone, axial spin vanes.
- Materials will be ASTM297 grade HE castings, 309 SS (in high heat affected areas), 304 SS, and carbon steel where appropriate.
- Burner front windbox cover plate.
- New windbox/burner adapter ring.
  Note: ABT has found that some windbox front plates can be warped, resulting in a variation in distance between the windbox plate and the waterwall throat. To provide an easier installation, ABT is providing a seal ring that will slide into the existing windbox opening and allow easier fit-up by compensating for windbox to waterwall variations. The seal ring would be field welded to the windbox (the register front plate comes from the factory bolted to the seal ring.)
- Two thermocouples, each with terminal connection head mounted on burner front plate, for plants use in remote monitoring of burner tip and barrel temperatures.
- Plug-in design requiring no modifications to the windbox, waterwalls or existing burner support rails.
- Burner seal ring to attach to the existing burner throat seal plate.
- All gaskets, nuts, bolts and washers required for field assembly.
- Burner flame view port with purge air connection and ball valve assembly.

3.2 Flame Scanner Systems

ABT offers a replacement flame scanner system, including scanners, amplifiers and connection cables. The base scope includes supply of an IRIS system. Option for supply of an ABB system is also offered that, if selected, would result in a price adder of the amount listed in proposal Section 5.

Both ABB and Iris have extensive experience and success with their systems. ABT's burner design is easily adaptable to either system. Our burner flame shape and intensity allow for reliable flame scanning. In this case we do not have preference of one scanner system over the other. Experience lists and detailed scope of supply for both systems are included in Appendix A-2 of this proposal.

Fifteen (15) man-days, 8 hr/day, of flame scanner system startup and operational testing time and two (2) man-days, 10 hr/day, hands-on training time for plant personnel is included in the pricing for supply of either system.

3.3 Individual Secondary Air Flow Measurement

Each burner assembly will be equipped with an Eastern Instruments (EI) DPU-Differential Pressure System. Four (4) VAP^{3TM}/PA Pitots will be positioned equally around the circumference of the burner register. Shop installed tubing will connect pitots to fittings mounted on the burner module's front plate. Eight (8) NEMA 4 cabinets, one for each burner elevation, will be supplied with factory installed differential pressure transmitters and root valves. Tubing between cabinets and burner modules will be supplied and field installed. Local indication will be displayed at the transmitter cabinets where terminals will also be provided for the plant's use, should indication in the control room be desired.

We selected the EI system for our burners for its durable, accurate, and maintenance-free design. The VAP^{3TM} /PA with its reverse sensors is designed to operate in heavy particulate environments where dust and granular residue may be present. Also, due to its unique Velocity Averaging^{TM} and Parallel Plate^{TM} patented design, the VAP can be installed in locations where random flow distribution may be present. More detail on features of the VAP is provided in Appendix A-3 of this proposal.

Four (4) man-days of EI startup and hands-on training time for plant personnel is included in supply of the EI measuring system.

3.4 Flow Modeling

In order to achieve balanced airflow to the burners, CFD modeling is required. ABT will subcontract to Airflow Sciences Corporation (ASC) to develop a model for the secondary air duct and burner windboxes. The model will be utilized to evaluate the air flow distribution to the burners. The results will be used to design any turning vanes, baffles or other distribution devices needed to improve airflow within the ducts and windboxes.

Materials (typically carbon steel baffle plates and turning vanes) will be supplied and installed where necessary as depicted by the model.

3.5 Drawings and Operating Manuals

Documentation of the proposed equipment and materials, including arrangement drawings, field installation, and operating instructions will be supplied to IPSC in the format, quantities and time frame requested. Fabrication drawings would be available for IPSC's review in our office, or at the respective fabrication shops.

3.6 ABT Field Services

ABT will dispatch an engineer for field installation and testing support to assist during the initial stages of installation, startup check-out and during optimization of the new combustion system. Included in this proposal are a total of 40 man-days of ABT technical service support for erection, start-up, optimization and operational testing. Should additional service time be requested by IPSC, it would be billed at $1000.00 per eight (8) hour day and time over 8 hours will be billed at a rate of $187.00/hour. Travel and living expenses associated with additional ABT support services would be billed at cost.

3.7 Mechanical and Electrical Installation

ABT will subcontract erection services to Maintenance Enterprises Inc (MEI). Firm prices associated with the installation is entered on the bid form "Bid Pricing Sheet". Appendix A-4 contains conditions and schedule associated with MEI's proposal for the installation scope of work.

Construction

4.0 Guarantees and Warranties

4.1 Workmanship and Quality:

1 yr 4 yrs Compare F2.3 4 yrs

ABT shall warrant the workmanship and quality of the supplied parts from the start-up date for a period of 12 months and 48 months for coal nozzle tips. ABT will supply a replacement for any supplied part which suffers a catastrophic failure due to design or workmanship flaws. IPSC will provide complete access to any supplied part that fails, including removal of any equipment that prevents access to the part to be replaced or repaired and removal and reinstallation of any complete ABT-supplied assemblies that cannot be repaired in-situ.

Changes to the appearance and dimensions of any part will be considered failures only if guaranteed emissions are affected to the extent that the unit is out of compliance and readjustment of burner operating parameters fails to return the emission to within guarantee level; and there are no changes to other equipment, operating methods, or fuel supply which could result in changes to the emissions.

B&W also

The following requirements apply to both the material warranty and the below listed guarantees:

- Primary air flows shall be within ± 5% of the mill manufacturer's design primary air flow vs. coal flow curve
- Mills will not be operated at full load with more than one burner out of service.

4.2 Reliability

The Opti-Flow™ fuel injector components will prevent coal layout and dropout as well as the potential resultant coking inside the fuel injector during normal start-up and operation. Failures caused by other equipment are excluded, for example: mill and control system problems, igniters, or failed/stuck burner shut-off valves.

4.3 Pressure Drop

4.3.1 Fuel Injector

The pressure drop across the new fuel injector, as measured between the inlet flange and the furnace, at the respective elevation, will be no greater than with the existing burner. The new fuel injectors will not limit boiler load.

4.3.2 Secondary Air

Windbox pressure will not exceed 2" W.C., with overfire air ports (to be supplied by others) open

Note: ABT will supply appropriate secondary air duct and windbox turning vanes and baffles to minimize secondary air mal-distributions to the windboxes and instabilities within each windbox.

4.4 NO_x

ABT guarantees that NO_x will not exceed 0.33 b/10^6 Btu, with overfire air ports closed, at the design excess air of Section 4.6 and 100% MCR. 7 mill operation

ABT predicts that NO_x with OFA ports open, with a flow of 20% of the total combustion air, will be less than 0.25 lb/MBtu.

NO_x is a function of several fuel variables, primary among them is fixed carbon to volatile matter (FC/VM) ratio and % fuel-bound nitrogen. Figure 4.1 represents the change in NOx guarantee parametrically in FC/VM against fuel nitrogen content as lb. $N_2/10^6$ Btu.

Note: The guarantee point represents the fuel properties specified in Section 4.9: 1.2% N_2 and 11.500 Btu/lb corresponds to 1.04 lb $N_2/10^6$Btu.

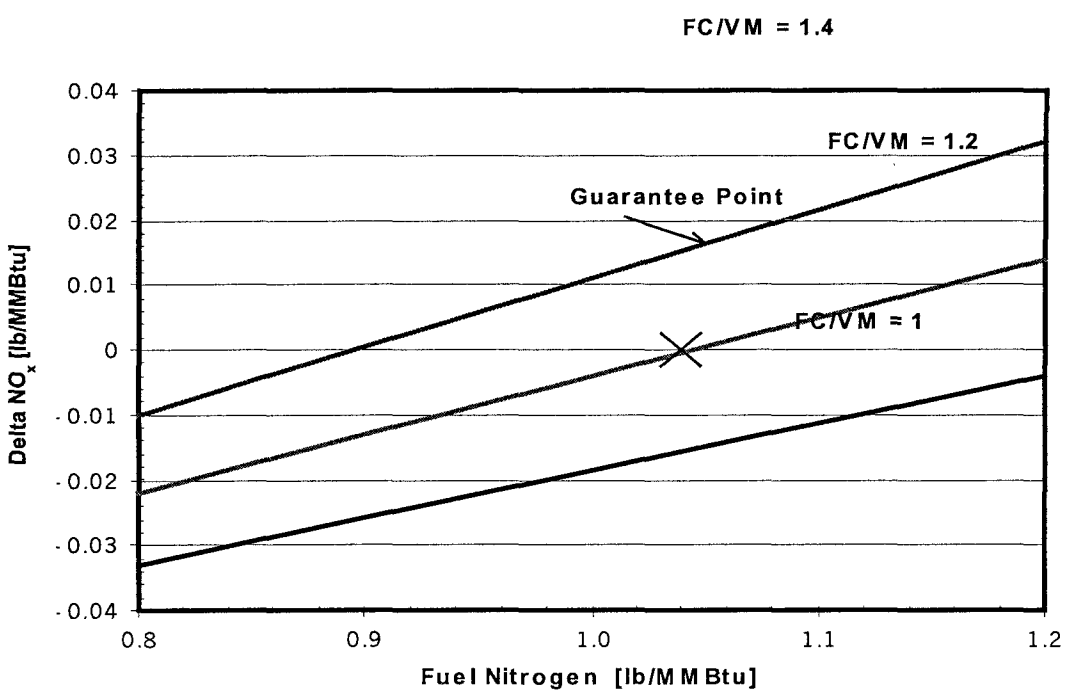


Figure 4.1 Change in NOx vs. Fuel Properties

Short-term periodic exceedances will be permitted provided the NO_x level returns below the guaranteed level after the unit stabilizes. This is necessary to accommodate potential NO_x variations during rapid load changes and while mills are coming in and out of service.

NO_x performance testing should be performed with both the CEMs and the economizer exit grid in operation. If the low NO_x system fails as indicated by CEMs but is within guarantee by the economizer exit test instruments, the latter shall govern and the CEMs shall be recalibrated against the test instruments.

4.5 CO

CO will not exceed an average of 200 ppm, with overfire air ports closed, at the boiler excess air as specified in Section 4.6 over boiler steam temperature control range, provided the fuel/mill conditions of Section 4.9 are met and that secondary air flows in each duct are steady and approximately equal (flow variations caused by plugged or unbalanced air pre-heaters are to be minimized).

4.6 Excess Air

The full load boiler excess air level at the burners will not exceed 15%. ABT will have the option of recommending a minimum O_2, across the respective boilers' steam temperature control range, at which NO_x, CO and LOI guarantees are simultaneously achieved, without deteriorating boiler performance.

4.7 Unburned Carbon Expressed as Loss On Ignition

LOI will not exceed the values obtained in pre-outage baseline testing; with overfire air ports closed with no more than 5% leakage/cooling air flow. This LOI level is guaranteed provided the conditions of Sections 4.6 and 4.9 are met; and the post retrofit LOI is sampled and measured using the same methods as in the pre-retrofit testing.

4.8 Boiler Performance

Boiler performance will not be deteriorated from the performance obtained during the baseline tests. Commercially acceptable variations in individual measured data will be acceptable (i.e., super heat temperature $\pm$ 10° F, etc.).
Boiler efficiency will not be lower than the baseline measurements, corrected for excess air and fuel conditions.

4.9 Mill and Fuel Conditions

The above guarantees are predicated on the following:

- **Mill Performance:**
  Air Flow: The low NO_x burners will be designed to slave to the mills' operation in that the fuel injector will be sized to follow the mills' primary air flow characteristic. Consequently, ABT will design the burners for the full load primary air flow, per mill, as per the OEM mill curves, with one mill out of service at boiler full load. Primary air flow must reduce as mill load decreases. PA flow will be determined during pre-retrofit testing defined in this proposal Section 2.4. Dan?

  Coal/PA Flow Balance: The balance between coal pipes within a given mill is to be within ±10% of the mean for that mill. (ABT recognizes that this is difficult to accomplish on all mills. Consequently, we will accept one of the eight mills being outside this range, to maximum of ±15%).

- **Fineness:** 99.5% < 50 Mesh and 70% < 200 mesh; all mills simultaneously.

- **Coal Properties:** Western U.S. bituminous:
  HHV > 11,500 Btu/lb; $N_2 \leq 1.2\%$; FC/VM ≤ 1.2; Ash ≤ 12%

4.10 Burner Load Variation

The nominal burner heat input at boiler full load with one mill out of service, is approximately 192 Mbtu/hr.

The ABT low NO_x burner's flame will remain stable at a load greater than 220 MBtu/hr, and less than 95 MBtu/hr.

Maximum secondary air flow at 220 MBtu per hour and 15% excess air, with 10% OFA flow will be no less than 124, 240 lb/hr.

Minimum secondary air flow will be determined by balancing the burner stoichiometry against the overfire airflow necessary to maintain minimum NO_x. Note that 45% load is below the steam temperatures control range listed on the B&W summary performance sheet.

4.11 Ash Patterns

The low NO_x system shall not increase or adversely alter the pattern of ash deposits on the furnace walls or high temperature superheater tubing such that existing soot blowing and/or steam de-superheating sprays cannot maintain tube cleanliness or steam temperatures. Furthermore, the burners shall not cause increased buildup of slag deposits around the burner openings (i.e., eyebrows).

4.12 Remedies for NO_x , CO and LOI Exceeding the Guarantee Values

ABT is offering a low NO_x combustion system consisting of state-of-the-art low NO_x burners. Since there are no technical combustion remedies currently available to correct a failure to meet specific combustion guarantees (if there were ABT would have included them within the original design) specific remedies are proposed.

Although we expect to meet the offered guarantees, we are proposing the following remedies in the event that NO_x/LOI/CO levels are not attainable.

4.12.1 Financial Remedies

a) NO_x Remedy

In the event that the NO_x guarantee is exceeded during the performance test and there are no combinations of burner adjustments that reduce the NO_x level to within the guarantee value, ABT will be permitted to adjust excess O_2 to reduce the NOx level to within the guarantee level, provided the requirements of Sections 4.8 and 4.10 are simultaneously met (i.e., no deterioration of boiler performance or ash patterns).

Liquidated Damage for NO_x: In the event the NO_x guarantee is not attainable ABT shall pay a liquidated damage of $50,000 per 0.01lb$NO_x$/$10^6$ Btu

b) LOI Remedy

In the event that the UBC guarantee is exceeded during the performance test, ABT will be permitted to readjust the firing system to reduce UBC to within guarantee levels. If there are no operational remedies and the criterion for the mills' fineness, performance, and coal are being met, ABT will pay a liquidated damage of $25,000/ 0.1% UBC in the fly ash.

c) CO Remedy

In the event that the CO guarantee is exceeded during the performance test, or as a result of the NO_x remedies of 4.9.1, ABT will pay a liquidated damage according to the following formula: $100\left(\frac{300}{1,000,000} - \frac{200}{1,000,000}\right) = 100\left(1/1000\right) = 1/10$

CO L.D. ($) =100 [Meas. CO – Guar CO] , where CO is in ppm corrected to 3% O_2.

4.13 Vendor Equipment

ABT will pass-through to IPSC the guarantees and warrantees for vendor-supplied equipment the Vendors offer to ABT.

5.0 Pricing & Schedule

5.1 Pricing: Pricing for base scope is provided on bid form "Bid Pricing Sheet".

5.1.1 Option: Adder to Supply ABB Flame Scanners per Section 3.2…**$ 55,385.00**

All prices include freight, FOB Delta, Utah.
Pricing quoted is subject to acceptance within 120 days of date of quotation.

5.2 Payment Schedule

20% ~~Invoice Upon Award~~
10% - Upon submittal of burner/FLAME DETECTION SYSTEM general arrangement drawings.
30% - Upon commencement of burner fabrication ~~RECEIPT~~ BURNER MATERIALS ON ORDER
30% - Upon receipt of the equipment at the job site in good condition *
10% - Upon successful start-up**

Payment Terms - Net 30 days from date of ABT invoice. Payments made later than 30 after date of invoice will incur 1.5% per month interest charge.

* Early material shipment to be acceptable, with equipment storage by IPSC. The 30% payment upon receipt of equipment shall be prorated based on percent of major material items delivered.

** Retention applies to Low NO_x equipment supply only. Installation and sub-supplier equipment and services are excluded from retention.

5.3 Delivery Schedule

The following schedule is based upon an award date of September 5, 2003.

a)	Award -	9/5/03
b)	Burner Drawings for Review and Initial Procurement -	11/03/03
c)	Commence Fabrication	12/01/03
d)	Commence Equipment Shipment	01/09/04
e)	Complete Equipment Shipment	02/13/04
f)	Commence Outage (see Appendix 4 for installation schedule)	02/28/04
g)	Start-up	3/24/04
h)	Optimization Complete	4/07/04
i)	Guarantee Testing Complete	4/13/04

5.4 Recommended Spare Parts

ABT does not recommend any spares associated with the fuel injector or burner register assemblies as there is low risk of failure and our customers have not seen the need for stocking any of the associated parts. The longest lead parts are castings, for which we maintain the patterns, that can be supplied within 1- 2 weeks.

Reference Appendix A-2 of this proposal for Flame Scanner System recommended spares lists.

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Reference Appendix A-2 of this proposal for Flame Scanner System recommended spares lists.

6.0 EXCEPTIONS AND CLARIFICATIONS

6.1 PART A DIVISION A1: NOTICE

1. Bid Validity:

   Bid Validity: 120 days required
   Delivery, February 23, 2004
   Release, September 5, 2003 — 24 weeks

   Date can not change.

   Delivery will delay day by day for each day contract release extends beyond 9/5/03.

2. Performance Bond

   A construction performance bond in the amount of 50% of the installation cost shall be supplied, if requested, the cost of which is approximately $15,000.00. This bond will terminate upon successful completion of the installation and customer acceptance.

   Instead of a 10% performance bond for equipment, ABT requests that IPSC use 10% retention to be released upon successful performance testing of the boiler.

6.2 PART B - DIVISION B1: INSTRUCTIONS TO BIDDERS

9. Award of Contract:

   If ABT is awarded this contract we would commence design work immediately, not upon execution of the contract by IPSC.

12. Performance Bond:
    Please see comment 2, Section

6.3 DIVISION B2, SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

Article 2: Incentives and Liquidated Damages

2nd Paragraph: Change to read: For completion ---- Contractor will be awarded $50,000 per day bonus.

3rd Paragraph: Change to read: For incomplete -------will be assessed $50,000 per day of delay.

Delete: "In the event the burner supplier does not provide for the installation---- penalty clause applies:"

Change boxed clause to read: "For delivery of all burner ------- components contract price". Delete last sentence.

Delete remainder of Section 2.

ABT anticipates shipments to the IPP job site will begin in early January, prior to installation contractor arrival on site. In case of early shipments, IPP would be responsible for off loading and storage of equipment.

6.4 PART C - DIVISION C3

See the following 2 pages.

Bidding Documents - Additional bid

1 b. There are no normally recommended or required spares. However, the plant may choose to have our fuel injector assembly (barrel & nozzle) on site in the event that a burner might be damaged by some external cause.

g. There are no environmental limitations to the coal burners

h. The coal burners will slave to the mills. There are no special modes of operation.

i. There are no special maintenance requirements. ABT suggests that, fly ash be cleaned from adjustable register components at the commencement of an outage if the boiler is to be water cleaned.

j. There are no required boiler modifications to accommodate the new burners.

6.5 DIVISION E1, GENERAL CONDITIONS

Article 5: Fabrication drawings and burner design calculations will not be supplied however will be available at the fabrication shop, or at our engineering office, for reference during visits by IPSC.
Drawings anticipated for delivery to IPSC include:

a.General Arrangement Drawings showing equipment arrangement.
b.Field Installation Drawings.
c.Instruction manuals for supplied equipment.

Additional Clarification to Spec. 45606

6.4 Part C-Division 3

1g. Bid form, Spec Page C-2, submitted with our proposal listed the max. and min. limitations of our offered equipment as being 2000^0 F and 140^0 F for the "Burner Tip" and "Scanner Electronic", respectively. Our design for specific components is based on their expected temperature exposure with the following limitations:

Component Description	Material Limitation, ^{0} F
Those exposed to direct furnace radiation, i.e. flow divider, spin vanes, throat casting, register front cone, fuel injector tip and flame stabilizers.	2000
Those semi-shielded from furnace radiation i.e. fixed vane spinner and inner zone damper perforated plate.	1600
Those shielded from furnace radiation, set back from furnace opening, and exposed to maximum windbox temperature, i.e. register sleeve dampers, register backplate, windbox coverplate, fuel injector barrel, elbow flatback and fuel distributors.	750

Explanatory Comment: The reason we stated that there are no environmental limitations to the coal burners is that the stainless steel castings and plate facing the fire, ASTM 297 Gr HE or 309 will not deteriorate at temperatures of at least 2000 F. We have never measured tip temperatures above 1600 F, in pre-NSPS furnaces that have input per plan levels as high as 2.3MBtu/hr/ ft^2 and Furnace Exit Gas Temperatures or 2400F and firing Eastern bituminous coals. These are a good deal higher than Intermountain and generate higher gas temperatures.

Consequently, we do not consider that operation of our design in your boiler to have any environmental limitations: the conditions are such that no material will operate anywhere near its limit. In fact we have placed no such limitations on any retrofit we have done.

1h. We will not require any special modes of operation in that the existing burner controls should not require changes. Burners will be setup during optimization (at 100% MCR) which will begin with components at predetermined positions similar to the following example:

Burner Secondary Air Sleeve Dampers (SAD)	80% Open
Burner Outer Air Registers Spin Vanes	40% Open
Burner Inner Air Sleeve Damper	20% Open

Following start-up these components are used to control the shape and ignition point of the flame, which in turn controls NOx, O2 distribution and CO emissions. The final settings are tabulated and provided to the customer for future reference. During normal operation, following optimization, further adjustments should not be necessary unless a significant change in fuel supply characteristics occurs.

In no case have we required any customer to modify normal procedures to accommodate our burners. However, as noted in the guarantee section, we do require good fuel balance in the coal pipes, accurate primary air flow measurement and control and that the Primary air flow decrease as mill load decreases. We do not consider these to be "special modes of operation"; rather good operation.

Article 13: Add at end of paragraph, "In no event shall Contractor be liable, whether in contract, tort (including negligence), warranty, strict liability, or any other legal theory, for any indirect or consequential damages, such as, but not limited to: cost of capital; loss of anticipated profits or revenue; loss of use or increased expense of using equipment or plant; loss of power or production; cost of purchased or replacement power or production; or claims of customers for loss of power or production."

6.6 DIVISION E2, ADDITIONAL GENERAL CONDITIONS

Article 1: ABT's offer is based on Warranty and Guarantee conditions as written in Section 4 of the Proposal.

6.7 DIVISION F1, DETAILED SPECIFICATIONS - SPECIAL CONDITIONS

Article 3: Delivery
Add: Notwithstanding the above, IPSC agrees to accept early delivery of burners if ABT's shop is ready to ship. Burners will be stored indoors at the site and unloaded by IPSC.

Article 6: General ABT Clarification on Insurance
The following clarifications to specific portions of this article are made regarding our current insurance coverage which has been satisfactory to all our customers' requirements. We therefore have not included additional premiums, associated with higher limits, in our pricing for this proposal. Should our current limits be unacceptable to IPSC, and we must raise them for an IPSC contract, the difference in ABT's premium would be added and billed to IPSC at cost.

Article 6a: Workers Compensation/Employers Liability: (revised requirements)
beginning on 4th line, strike words beginning with "Voluntary" through end of this sentence.
Beginning 11th line, strike words beginning with "waiver of subrogation " through the end of this paragraph.

Article 6b: Commercial General Liability: (revised requirements)
Line 5 and 7 strike "$5 million", replace with "$2 million",
Line 6, strike words "and be specific for the contract",
Line 9, strike 'IPSC's", replace with "standard",
Beginning on Line 10, strike the words "or an endorsement of the policy acceptable to IPSC"'
Strike all of subparagraphs "(2)", "(3)", and "(5)".

Article 6c: Commercial Automobile Liability: (revised requirements)
Next to last line, strike words "as required" and replace with "revised requirements"

Article 6d: Professional Liability: (revised requirements)
2nd line strike words "with Contractual Liability included,",
4th line strike "$5 million", replace with $1 million",
Beginning on 5th line strike the entire sentence beginning with "Evidence", replace with "Such insurance may be an endorsement to the Commercial General Liability Policy without separate aggregate."

Article 6e: Other Conditions: (revised requirements)
Strike entire subparagraph (1)
In subparagraph (2) Line 2 insert the word "revised" between the words "these" and "insurance".

6.8 DIVISION F2, DETAILED SPECIFICATIONS - DETAILED REQUIREMENTS

Article 5e: ABT supply includes two thermocouples, each with its own terminal block head mounted on the burner windbox cover plate. The heads will have a removable cover for IPP access to terminals for remote temperature indication of fuel injector tip and barrel.

Article 5l: ABT supply includes one port per burner assembly with observation glass to view flame. Each port will be equipped with purge air connection and ball valve should the need arise to purge the view pipe.

7.0 The Opti-Flow™ Low NO_x Firing System

Advanced Burner Technologies' Opti-Flow™ low NO_x burner, which contains the fuel injector and dual register, is installed as a "plug-in" module. The existing burner throat opening in the water wall is used, as are the present support rails. In addition, we maintain the same opening in the windbox. No pressure part modifications or windbox modifications are required. All components are shop installed including the airflow elements, associated tubing and fittings.

ABT has developed an elbow-based fuel distribution system, which yields nearly uniform distribution of coal at the burner tip. These components are installed in the existing ceramic lined sweep elbow. All of the wear surfaces of these components are protected with ceramic wear materials.

Since its conception, ABT has constantly striven to produce a better Low NO_x combustion system. We consider all aspects of the system from combustion products (low NO_X, CO, & LOI), the effects on the furnace (slagging, fouling, and water wall corrosion), and the cost both from the purchase price to the O&M budget. We take seriously comments from the customer, the installation labor, and operational difficulties. As part of this effort, we have continually simplified the burner, both the register and the fuel injector.

7.1 Opti-Flow™ Low NO_x Burner

a) Fuel Injector Sub-Assembly

The fuel injector, a novel ABT Opti-flow™ design with a segmented nozzle and a fuel distributor, is made from highly wear resistant ceramic components, mounted in the elbow.

There are no internal devices in the fuel injector, other than the flow distribution devices in the elbow, that could cause coal layout or require periodic maintenance.

The components and their functions are briefly described as follows:

- Flow Distributor: A fuel distribution device in the elbow breaks the rope formed in the coal piping in order to provide uniform fuel distribution at the nozzle. A more complete discussion, "Opti-Flow™ Distribution System for Elbow-Based Fuel Injectors", is contained in section 7.2.

- Opti-Flow™ Low NO_x, Flame Stabilization Nozzle: This is the key element for attaining excellent flame stability and minimum NO_x. Figure 7.1, shows the segmented coal nozzle, which has an open design with no obstructions to collect coal. Pressure drop is low, and there are no components in the coal path that are subject to wear, coal accumulation or coking. Excellent flame

stability is achieved due to the external flame stabilizers surrounding each segment.

- Inner Air Zone Swirler: This fixed vane swirler is attached to the outer barrel of the fuel injector. The position of the swirler is fixed and no adjustments are required.

A schematic of the Opti-Flow™ dual register is shown in Figure 7-2.

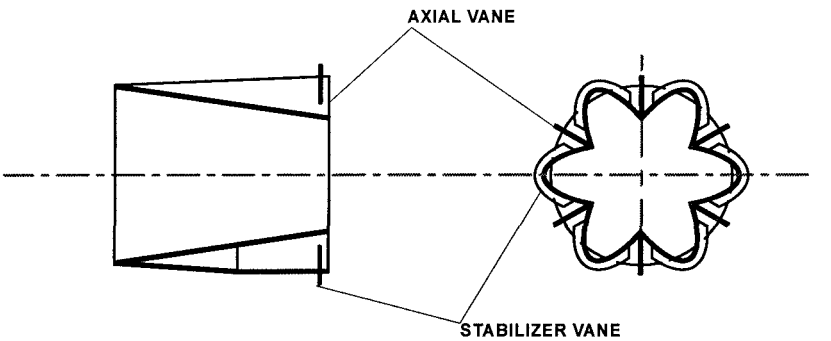

Figure 7.1 Opti-Flow™ Coal Nozzle

b) Opti-Flow™ Dual Register Assembly

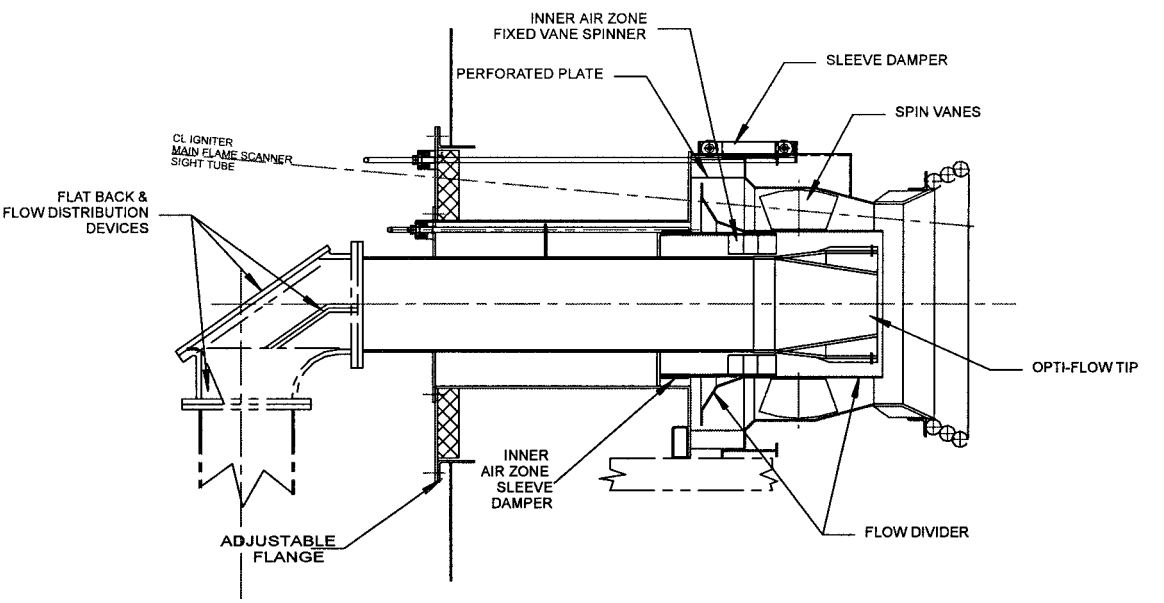

Figure 7.2 Opti-Flow™ Dual Register Assembly

Key features of the Opti-Flow™ dual register sub-assembly include:

- Sleeve Damper: Air flow to each burner is controlled by a manually operated sleeve damper. This damper is used to balance the air flow between burners. The vanes are manually adjustable from the burner front to optimize the secondary air swirl in the outer zone.

- Inner Air Zone Damper: The sleeve damper is axially adjustable to vary the ratio of airflow between the inner air zone and the outer air zone. This is a manual adjustment made during optimization.

  Mechanically the damper is very simple. Because of its smaller size and weight, it rides on two stainless steel rods and is actuated by a push/pull rod. It is welded to the actuator rod to prevent any cocking of the sleeve.

- Outer Spin Vanes: The vanes are manually adjustable from the burner front to optimize the secondary air swirl in the outer zone. The actuator is two manually operated push/pull rods, which translate a "bull ring", moving linkages which rotating all of the spin vanes. This system has no components subject to binding by ash deposits and has little hysteresis.

- Low pressure drop register: The register has been designed for low pressure drop by the addition of turning vanes in the outer air zone and lower velocities in the spin vane section.

- Burner front plate flange: Flange adjusts to accommodate distortions in the windbox plate and it allows the burner throat casting to be located in the throat, regardless of furnace wall or windbox location. The bolted joint can be convenient, in the future, for removal of the burner module for maintenance.

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7.2 Opti-Flow™ Fuel Distributor

Unbalanced fuel distribution leaving the coal nozzle tip and the resultant operating problems are caused by similar deficiencies in all pulverized fuel injectors. Coal is separated from its carrier (primary) air inside the inlet device, be it scroll, elbow, or 90° turning head, resulting in "roping" of the coal inside the primary stream. Redistributing the "rope" downstream of the inlet has been an inherent problem with burner designs. ABT's method of improving fuel distribution consists of a system of several interrelated components.

Advanced Burner Technologies has developed an elbow-based fuel distribution system, which yields nearly uniform distribution of coal at the burner nozzle's exit. This system reduces the fuel imbalance that occurs in standard elbow-based fuel injectors by a factor of approximately 4.5 to 1; and by over 3 to 1 as compared to other types of burner inlets (i.e., scrolls or t-type heads). Figure 7-3 illustrates the results of our two-phase physical flow modeling with a standard 90°-flatback elbow. The distribution system is also designed to accommodate sweep elbows.

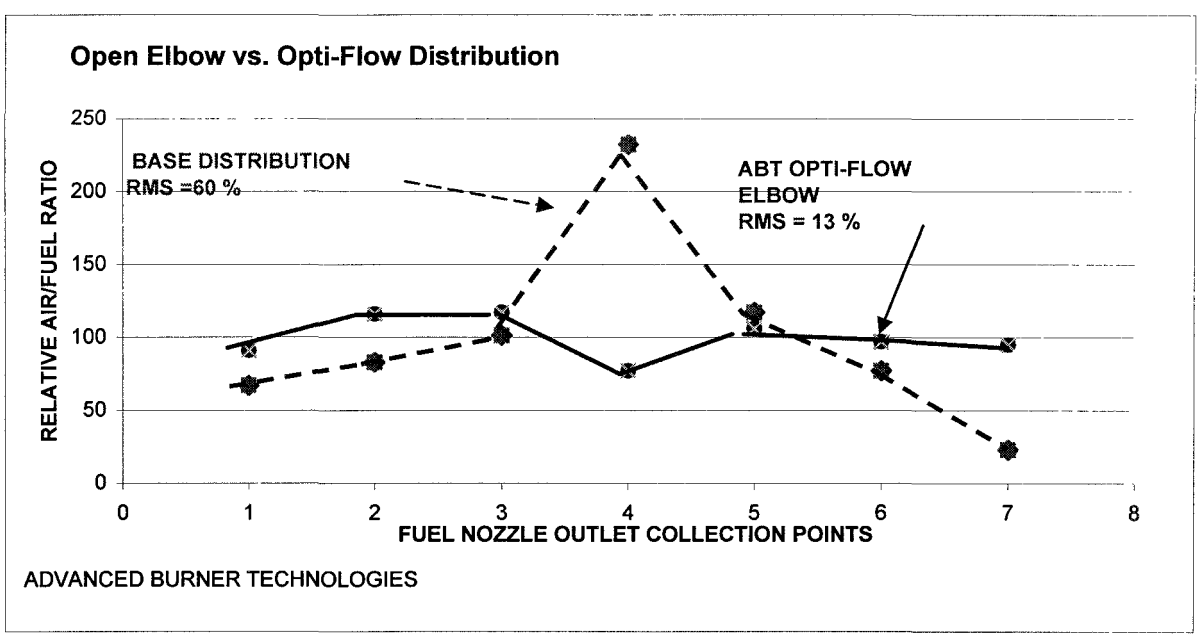


Figure 7.3 Comparison of Open Elbow and Opti-Flow™ Distribution

Baseline testing was performed with an open elbow and fuel nozzle in order to determine the uncontrolled distribution of particles at the outlet of the nozzle. A seven-point collection matrix was used: six points around the circumference and one collection point on the axis. As expected, the fuel distribution was severely unbalanced with an RMS value of 60% of the mean. The Opti-Flow™ modifications

resulted in a significant improvement. The RMS value was reduced to 13% of the mean - an improvement of 4.62 over the baseline. Existing elbow-based fuel injectors that contain conical diffusers suffer from fuel imbalances of 36% RMS. In this case, the Opti-Flow™ system yields a 3 to 1 improvement in fuel distribution.

Severe fuel imbalance can result in the following problems:

- High-unburned carbon
- Long flames
- Flame instability problems.
- NO_x control problems

The significant improvement in fuel distribution provided by the Opti-Flow™ system will correct these problems to the extent that they are caused by fuel imbalance within the coal nozzles. Other fuel distributors cause coal "ropes" to impact on the coal nozzle and, thereby, reduce the nozzle's usable life. In the ABT design, all wear is limited to the wear-resistant devices in the elbow
The Opti-Flow™ system eliminates coal ropes and produces a nearly uniform fuel/air mix with axial flow downstream of the elbow. Therefore, the only erosion-prone areas will be located within the elbow. These areas will be lined with erosion-resistant materials and will be easily replaceable when necessary. A further advantage of this fuel distribution system is that, when used in conjunction with the Opti-Flow™ segmented nozzle, NO_x can be reduced compared to existing nozzles used for tangential firing.

The Opti-Flow™ Fuel Distribution System consists of:

1. The existing coal elbow with ABT's distributor vane package installed to break the coal rope formed in the fuel piping. All surfaces, including the leading edges are protected with ceramic tile.

2. A ceramic device at the coal elbow inlet will be used in conjunction with distributor vanes for equalizing coal flow to the tip.

7.3 IMPLICATION FOR FIELD RESULTS

Within a flame of a low NO_x burner, poor fuel distribution around the nozzle's circumference results in degraded emissions and efficiency performance. Optimal combustion - minimum NO_x and minimum unburned carbon, simultaneously - occurs when the circumferential fuel distribution is uniform (assuming primary air and secondary air distribution are also uniform). When this condition exists, the environment surrounding all fuel particles is the same and, therefore, results in uniform combustion conditions.

However, in practical operation, there are several conditions both external and internal to the fuel injector that precludes uniform fuel distribution. As a result, this prevents uniform air/fuel (stoichiometric) conditions within any flame from being attained.

Externally, non-uniform fuel flow inside the coal pipe, upstream of the fuel injector's inlet, causes imbalances further downstream within the fuel injector.

Internally, all burners, regardless of inlet type, develop unbalanced coal flow that yields wide variations in stoichiometry within the flame. Stratification that causes high fuel flow will result in very low stoichiometric zones in the flame. On the other hand, stratification that causes low fuel flow will result in very high stoichiometric zones in the flame. The former generates high-unburned carbon levels; the latter generates high NO_x levels.

Since both unburned carbon and NO_x generation are non-linear functions of oxygen availability (stoichiometry), the high and low stoichiometric portions of the flame do not compensate each other for their respectively high NO_x/low UBC and low NO_x/high UBC levels. The consequence of this effect is that the unbalanced flame generates NO_x and UBC levels that can be significantly higher than anticipated.

Table 7-1 compares the minimum and maximum relative fuel flows of the Base-Std OEM design and the Opti-Flow™ design to perfectly balanced conditions. The resultant local flame stoichiometries and relative effects on NO_x and UBC levels are also tabulated.

TABLE 7-1
Standard vs. Opti-Flow™ Burner:
Effect of Fuel Imbalance on Relative NO_x & UBC

Condition	Fuel Flow (Relative)	Local Flame Stoichiometry	Relative NO_x	Relative UBC
Base-Std	Min. 0.61 Max. 1.59	1.97 0.75	>>1.0 <1.0	<1.0 >>1.0
Opti-Flow™	Min. 0.90 Max. 1.22	1.33 0.98	1.0+ 1.0-	1.0- 1.0+
Perfect Balance	1.0	1.2*	1.0	1.0

*Assumes 20% excess air operation (stoichiometry = 1.2)

Based upon these comparisons, it is reasonable to predict that, all other operating parameters and conditions being equal, the Opti-Flow™ low NO_x fuel injector will produce lower NO_x and lower Unburned Carbon than a standard burner.

Field retrofits on large utility boilers have confirmed this analysis: NO_x has been reduced 40% below the levels attained with the OEM's burner, while unburned carbon has not been increased.

IP7_031097

August 19, 2003

ABB Inc.
Proposal No. U030304A Rev. 1

Mr. Sal Ferrara
Advanced Burner Technologies
350 Main Street, Suite 5
Bedminster, New Jersey 07921

Dear Mr. Ferrara,

ABB Inc. is pleased to offer our SafeFlame™ DFS Scanner System for use on your Low Nox Burner. We propose our SafeFlame™ visible light fiber optic scanner for monitoring the pulverized coal and class I oil lighters on forty eight (48) opposing wall fired low NOx burners. The proposed scanner is an extremely rugged field proven device with nominally 11,000 in operation around the world today. A description of the scanner system is provided in Attachment 1.

The proposed flame scanners are mounted in 2" ridged guide pipes. ABB has included with this proposal packing glands that can be welded to the new burner front plate. This will allow for removal and/or adjustment of the scanner guide pipe position in the burner.

Dimensional drawings of the flame scanner, guide pipe, and chassis are attached.

The hardware proposed below is for installation of the SafeFlame DFS electronics on each burner deck. A window kit is installed in each chassis enclosure to allow for visual access to scanner status without having to open the NEMA 4 enclosure.

BASE OFFER – SINGLE SCANNER PER BURNER

ITEM	QTY	DESCRIPTION
1	48	SafeFlame™ Fiber Optic Flame Scanner: • Cast aluminum housing • Visible light photodiode board assembly • 9 degree viewing angle lens • High Temperature fiber optic cable • ¼ turn stainless steel electrical quick disconnect on scanner

2	48	2" Ridged scanner guide pipe mounting assemblies • Stainless steel centering tip • 2" schedule 40 pipe • Cast aluminum cooling/purge air manifold
3	48	Guide pipe packing gland: • For use with 3" NPT burner front plate opening • Holds and seals 2" scanner guide pipe
4	48	Flame scanner connector cable assembly: • ¼ turn stainless steel connectors, one end • 50 foot scanner wire pigtail length • ½" NPT connection for installation in liquidtite conduit • Connector connection potted
5	16	SafeFlame™ DFS front access chassis each consisting of: • Three (3) DFS sensor modules • Two (2) blank module • One (1) 115 VAC DFS power supply module • One (1) front access 19" wide rack mount DFS chassis
6	16	SafeFlame DFS chassis enclosure: • NEMA 4 construction • Door window kit • DFS chassis (item 5) factory mounted
7	9	SafeFlame™ DFS Instruction Manuals
8	15	Man-days, (8) hours/day, for startup & testing
9	2	Man-days, (10) hours/day, for plant training

AVAILABLE OPTIONS

Option 1

ABB Inc. Technical Services Support is available in addition to support that is already included for start-up, testing, and on-site training. Additional support services would be at the prevailing rates at time of service. 2003 service rates as detailed in Attachment 2.

The home office for all ABB scanner service engineers is out of the ABB Windsor, CT offices. The contact for scheduling service is John Iovino, 860-285-6784. Mr. Iovino co-ordinates scheduled and emergency service based on available personnel at the time of service.

Option 2

The SafeFlame™ Sensor Module Communication Server (SMCS) is available as an option. This 19" rack mount device is a MODBUS slave that interfaces directly to a plant DCS system and allows real time scanner data to be downloaded into the DCS system via. an RS-232 or RS-485 MODBUS port. This allows scanner data to be presented to operating personnel using existing DCS monitors and displays. The SMCS is not required for normal scanner setup or operation and does not replace the dry flame contacts used for safety in the Burner Management System. Refer to Attachment 1 for a scanner network configuration.

Each SMCS can be connected to a maximum of 6 SafeFlame™ DFS chassis therefore; four SMCS would be required for this installation. The SMCS would be mounted in four of the DFS chassis NEMA 4 enclosures located in each of the boiler corners.

The price for four (4) optional SMCS is:
$10,000 USD
(Ten Thousand US Dollars)

Option 3

The SMCS offered in option 3 has a digital output that can be connected to a Personal Computer rather than the DCS system. As an option, ABB offers a personal computer based data trending and data archiving software package, called ***Flame Explorer,*** which can be used with one or more SMCS. This package can be used to assist plant personnel in initial setup of the scanners and monitoring during routine operation. This optional software package is $2,250 for a single client seat license.

The SafeFlame DFS modules can be programmed locally using the faceplate pushbuttons and display. The ***Flame Explored*** software is not required for tuning the scanner system, rather it is only a tool to make tuning easier.

Option 4

If the scanners are properly located, redundant flame scanners should not be required for reliable flame detection. (see notes and clarifications below). However, if redundant scanners are desired the modified scope and pricing is:

ITEM	QTY	DESCRIPTION
1	96	SafeFlame™ Fiber Optic Flame Scanner: • Cast aluminum housing • Visible light photodiode board assembly • 9 degree viewing angle lens • High Temperature fiber optic cable • ¼ turn stainless steel electrical quick disconnect on scanner
2	96	2" Ridged scanner guide pipe mounting assemblies • Stainless steel centering tip • 2" schedule 40 pipe • Cast aluminum cooling/purge air manifold
3	96	Guide pipe packing gland: • For use with 3" NPT burner front plate opening • Holds and seals 2" scanner guide pipe
4	96	Flame scanner connector cable assembly: • ¼ turn stainless steel connectors, one end • 50 foot scanner wire pigtail length • ½" NPT connection for installation in liquidtite conduit • Connector connection potted
5	32	SafeFlame™ DFS front access chassis each consisting of: • Three (3) DFS sensor modules • Two (2) blank module • One (1) 115 VAC DFS power supply module • One (1) front access 19" wide rack mount DFS chassis
6	16	SafeFlame DFS chassis enclosure: • NEMA 4 construction • Door window kit • Two (2) DFS chassis (item 5) factory mounted
7	9	SafeFlame™ DFS Instruction Manuals

The price for the material detailed in the option 4 furnished upon request.

ABB

Option 5

Safe Flame DFS Spare Parts are offered at a 25% discount if purchased on the same purchase order as the flame scanner system. The major spare parts and quantities recommended for the base scanner system is shown in Table 1 along with the list price and 25% discounted price. The scanner head delivery is typically less than 5 weeks with the rest of the components in stock, available for next day delivery.

Table 1 – Scanner System Spare Parts

Quantity	Item Description	Part Number	Per Unit List Price	Unit Price 25% off if purchased w/scanner system	Total Discounted Price
4	Visible Light Scanner	C10-922XX-LP	$1,710.00	$1,282.50	$5,130.00
6	Cable/Connector Assembly	C10-97252	$291.00	$218.25	$1,309.50
4	DFS Sensor Module Assembly	C86-94639	$1,010.00	$757.50	$3,030.00
3	DFS Power Supply	C86-80741	$800.00	$600.00	$1,800.00
6	4 amp pico fuses	C32-32012	$4.20	$3.15	$18.90
				Total =	**$11,288**

Price escalation on flame scanner replacement parts through 2010 is nominally 1% per year. In addition the recommend spare parts, a detailed parts list is in Attachment 4.

NOTES AND CLARIFICATIONS

1. ABB experience on multiple air zone, wall fired coal burners has been that the coal flame flicker frequency is much stronger in the inner air zone vs. any outer air zones. Since background flicker frequencies do not change with the inner or outer air zone scanner locations, any increases in measured flame flicker frequency improve the overall scanner performance and makes the flame detection more robust. Therefore, ABB recommends the flame scanners be installed in the inner air zone.

2. The selection of one visible light scanner fiber optic scanner for both oil and coal flame detection is based on the premise that; the oil flame shape and "color" does not change dramatically during the transition between oil flame with no primary air (PA) flow to oil flame with primary air flow. ABB has observed on some coal burners with center mounted

oil lighters a dramatic change in the oil flame when PA is introduced. The oil flame changed from a standard, turbulent oil flame, to a "gas like" laminar flow flame. When a change like this occurs a visible light scanner is not the best choice for the oil lighter. When this occurs a second, UV flicker scanner, should be added for oil flame detection. Based on phone discussion between yourself and our Product Manager, Jim Niziolek, this oil flame shape does not occur with the Advanced Burner Technologies Design and therefore, a single scanner for both oil and coal will suffice for this application.

3. For this application ABB would recommend a nominal scanner purge airflow of 20 SCFM at 3 IN-WC static pressure. The purge/cooling air specification for the existing ABB FLAMON UW scanners calls for 15 SCFM at 10 IN-WC above furnace pressure. On past FLAMON to SafeFlame fiber optic scanner retrofits the existing purge air system has been more than sufficient to keep the scanners cool and the existing fans have not been changed. Therefore, if the existing scanner air system provides clean purge air it should not need to be replaced with the 48 scanner system. ABB would however, like the opportunity to review the existing scanner fan specifications to insure the capacity is sufficient.

4. Detailed temperature specifications for the flame scanner fiber cable, scanner head, and electronics is in Attachment 1.

5. Ten time per second the DFS sensor module runs system diagnostics from the scanner head photodiode to the microprocessor A/D converter. In the unlikely event a problem is detected the flame relays in that sensor module will de-energize and a fault will be indicated on the face of the scanner sensor module. These diagnostics include:

   5.1. ROM memory (on power up)
   5.2. RAM memory (on power up)
   5.3. Positive power supply low
   5.4. Negative power supply low
   5.5. A/D failure
   5.6. Sensor positive supply short
   5.7. Sensor negative power supply short
   5.8. Input signal high
   5.9. No input signal
   5.10. Frequency over range

6. The highest background flicker frequencies are created from opposed wall lighters during initial start-up of the boiler. As coal is introduced into the boiler the background flicker decreases to 0 Hz. The SafeFlame DFS Sensor module has two flame relays. If desired, one flame relay can be set with trip points commensurate with the background conditions observed during start-up while the other can be adjusted for conditions observed during normal coal operation. In this fashion the scanner system will provide the flame discrimination required while allowing the system to be as forgiving as possible to firing system perturbations or flame shape changes.

7. There are no specific routine maintenance requirements. Scanner maintenance is basic:

   7.1. As needed – If scanner intensity drops within 10% of the trip point, the scanner should be removed and the lens cleaned. If clean purge air is supplied to the scanner, this cleaning may not be needed except as a preventative measure after an extended outage.
   7.2. During outages
      7.2.1. If burner work is to be performed removed scanner to avoid mechanical damage
      7.2.2. Inspect and clean lenses if necessary after and extended outage
      7.2.3. Periodically blow dirt and dust from electronics
      7.2.4. Periodically check tightness of all terminations

8. One or more of the following technical personnel will supply support to the proposed scanner system design:

Jim Niziolek	Product Manager	860-285-6775	27 years experience
Paul Chase	Chief Engineer, Scanners	860-285-6762	35 years experience
Bill Clark	Production/Quality Manager	860-285-9402	25 years experience
Arnie Piellucci	Project Engineer	860-285-6871	25 years experience

EXCLUSIONS

The following items are not included as part of this offer and are the responsibility of others.

- Mounting, installation, and wiring of new hardware
- Connection of the scanner flame outputs to the BMS system
- Scanner cooling air system piping
- Guide pipe installation in burner
- BMS system changes

REFERENCE LIST

A list of user contacts is in Attachment 3.

DELIVERY

Standard delivery is 10-12 weeks ARO. Expedited delivery may be available depending on shop loading at time of order.

TERMS

Payment terms are net 30 from invoice. Invoices to be issued upon shipment.

Standard ABB Inc. Terms and Conditions apply and are attached.

Pricing quoted is subject to acceptance within 120 days of date of quotation.

Prices include shipping (except freight for spares will be pre-paid & billed at cost).

I thank you for this opportunity to quote our SafeFlame™ DFS System for your coal fired application. If you have any questions on this offer or other questions regarding the scanner system hardware, please feel free to call me at 860-285-6895 or our Product Manager, Jim Niziolek at 860-285-6775.

Respectfully Submitted,

Sam Good
Proposal Specialist

ABB Inc
2 Waterside Crossing
Suite 200
Windsor, CT 06095

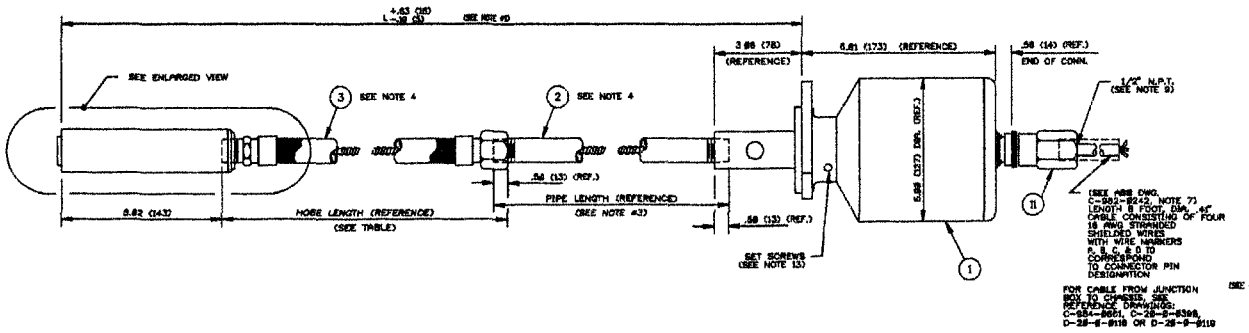
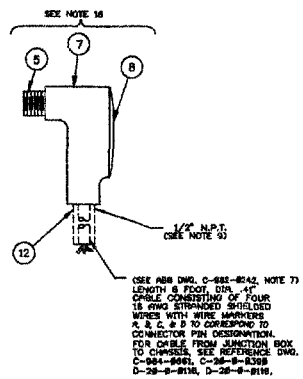


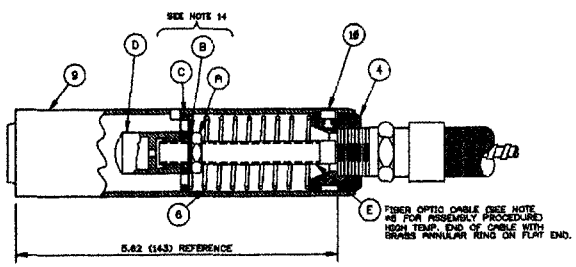
TABLE 1 (SEE NOTES 1 & 2)
SCANNER SELECTION TABLE

HOSE NO.	HOSE PART NO.	HOSE LENGTH	"L"	ASS'Y. P/N	ASS'Y P/N (LESS ITEM NO. 11)
1	C54-91977	42.96 (1090)	51.25 TO 69.19 (1302 TO 1757)	C18-92294	C18-92294-LP
2	C54-97255	60.96 (1524)	68.25 TO 85.19 (1734 TO 2164)	C18-92295	C18-92295-LP
3	C54-97256	72.96 (1829)	85.25 TO 104.81 (2165 TO 2713)	C18-92296	C18-92296-LP
3	C54-97256	72.96 (1829)	104.81 TO 126.81 (2713 TO 3221)	C18-92237	C18-92237-LP
4	C54-97278	36.96 (782)	39.25 TO 51.25 (997 TO 1302)	C18-92297	C18-92297-LP
5	C54-97258	24.96 (610)	33.25 TO 45.25 (845 TO 1149)	C18-92298	C18-92298-LP

TABLE 2 (SEE NOTE 15)
SCANNER HOUSING FIBER OPTIC CABLE SELECTION

STANDARD LENGTH (A)	EXTENDED LENGTH (B)
X=118"	X=138"
PART NO. C18-92238	PART NO. C18-92239





ENLARGED VIEW
SCALE: FULL SIZE

BILL OF MATERIAL

	ITEM NO.	NO. REQ'D	PART NO.	DESCRIPTION	MAT'L. ITEM
(SEE NOTE 15)	1	1	SEE TABLE 2	SCANNER HOUSING ASSEMBLY VISIBLE LIGHT	—
	2	1	—	1/2" SCH. 40 PIPE (T.B.E.) (SEE NOTE 3)	154
	3	1	SEE TABLE 1	FLEXIBLE HOSE, A984-8477	—
	4	1	C55-91967	PLUG, A-987-839	—
	5	1	C43-18186	CLOSE NIPPLE, 1/2" N.P.T. STEEL	
	6	1	C58-18317	COMPRESSION SPRING, B232666-847	—
	7	1	C46-69817	CONDUIT BODY, 1/2" N.P.T.	
	8	1	C46-69178	COVER, CONDUIT BODY, 1/2"	
	9	1	C18-97248	FLAME SCANNER HEAD ASSEMBLY, B232666-849	—
	10	3	C58-95192	8-32 UNC SOCKET HEAD CAP SCREW, .19 (5) LONG	282
	11	1	C18-97252	ADAPTER ASSEMBLY 8", C-982-8242	—
(SEE NOTE 8)	12	A/R	C99-91730	1/2" FLEXIBLE CONDUIT	—

NOTES:

1. "L" DIMENSION AS SPECIFIED ON WINDBOX ARRANGEMENT DRAWING AND REQUISITION. THE "L" DIMENSION IS EQUAL TO "A" PLUS .38 (10). FOR "L" DIMENSION, SEE FLAME SCANNER GUIDE PIPE ASS'Y DWG'S. D-982-8140, C-982-8140 & D-982-8438 "L" MAXIMUM = 104.81 (2713) & "L" MINIMUM = 51.25 (1) WINDBOX).
2. SELECT HOSE LENGTH (ITEM #3) TO ENSURE MAXIMUM FLEXIBILITY FOR SCANNER REMOVAL (SEE TABLE).
3. PIPE LENGTH (ITEM #2) EQUALS "L" DIMENSION MINUS HOSE LENGTH MINUS 7.86 (195)
4. APPLY FEL-PRO-C-108 HI TEMP ANTI-SEIZE OR EQUAL TO ALL THREADS AT ASSEMBLY.
5. PULL DESIRED LENGTH OF FIBER OPTIC CABLE FROM HOUSING ASSEMBLY AND PASS THROUGH PIPE (ITEM #2) HOSE (ITEM #3) AND PLUG (ITEM #4). SCREW (ITEMS 2, 3 & 4 TOGETHER. ASSEMBLE (ITEMS (A) THROUGH (E) (SEE NOTE #14). GENTLY PUSH EXCESS CABLE BACK INTO HOUSING. SLIDE HEAD ASSEMBLY (ITEM #9) OVER PLATE, SPRING AND PLUG. COMPRESS SPRING AND LOCK PLUG INTO HEAD WITH SCREWS (ITEM #10).
6. ASSEMBLE ADAPTER ASSEMBLY (ITEM #11) TO SCANNER.
7. CLEARANCE SPACE REQUIRED FOR PULLING THE SCANNER REMOVAL OF THE GUIDE TUBE IS APPROX. EQUAL TO THE PIPE LENGTH (ITEM 2) PLUS 12".
8. SCANNER CABLES TO BE ISOLATED FROM ALL OTHER WIRING FROM SCANNER ADAPTER TO SCANNER CHASSIS.
9. 1/2" FLEXIBLE CONDUIT TO MEET CUSTOMERS' AREA CLASSIFICATION, NOT SUPPLIED BY ABB INCLUDE MINIMUM LENGTH TO ALLOW FOR BOILER EXPANSION.
10. THE COOLING AIR SUPPLY FROM IGNITOR FAN OR SEAL AIR SYSTEM MUST BE MAINTAINED GREATER THAN 8.8M W.G. (1.46 KILOPASCALS) ABOVE FURNACE PRESSURE FOR ALL OPERATING CONDITIONS. .39 SCFM (dm 1/SEC.) MINIMUM.
11. DIMENSIONS ARE IN INCHES WITH MILLIMETER EQUIVALENT IN PARANTHESIS ( ).
13. BEFORE INSTALLATION, TIGHTEN SET SCREWS IN HOUSING ASSEMBLY.
14. ASSEMBLE ITEMS (A) THROUGH (E) (REF D-232666-822) BY DOING THE FOLLOWING:
    A. PLACE ITEMS A, B, & C AS FAR BACK ON FIBER OPTIC CABLE (ITEM 5) AS POSSIBLE.
    B. THREAD ITEM (D) LENS BARREL INTO FIBER OPTIC CABLE (ITEM 5) UNTIL IT BOTTOMS OUT.
    C. THREAD ITEM (A) (JAM NUT) TOWARDS ITEM (D) UNTIL TIGHT
15. STANDARD LENGTH (A) FIBER OPTIC CABLE USED FOR "L" DIM. UP TO 105.81 (2713mm) USE EXTENDED LENGTH "B" FIBER OPTIC CABLE FOR "L" DIMS. FROM 104.81 TO 126.81 (3221mm)
16. AN OPTIONAL RIGHT ANGLE CONDUIT OUTLET BOX THAT ADAPTS TO ITEM 11 IS AVAILABLE UPON REQUEST. REFER TO ITEMS: 5, 7 & 8.

MATERIAL SPECIFICATION CHART

MAT'L. ITEM	SPECIFICATION	PURCHASE INSTR.
154	CARBON STEEL A-120	—
282	CARBON STEEL AISI B16.6.2	—

SAFE FLAME™ I, II & DFS FLAME SCANNER
8' VIEWING ANGLE VISIBLE LIGHT FLAME SCANNER ASSY.
WITH HIGH TEMP. FIBER OPTIC CABLE
-STANDARD-

THIS DRAWING IS THE PROPERTY OF FOSSIL CONTROLS DIVISION WINDSOR, CONNECTICUT U.S.A. 06095 A DIVISION OF ABB AUTOMATION INC.

ABB

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DRAWING SCALE: NONE
PART SCALE: 1 : 1
DATE: 2/05/03
DRAWN: STANDARD
PART NO.: STNRD-D232665-825
REV. 02
N

ORIGINAL 1

CONTROLS

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ATTACHMENT 2
2003 DOMESTIC FIELD SERVICES RATES

ABB Inc. Utility Automation Service is pleased to offer site technical assistance at the following rates and conditions of payment.

The services described above are offered at the per diem rate of $1360 per normal work day. A normal work day is defined as the first eight (8) hours worked during any day from Monday to Friday. A minimum charge of eight (8) hours is applicable for every normal work day commencing from the initial travel day to the purchaser's site and ending on the final travel day at the conclusion of the site assignment. Initial and final travel time is billable at the normal work day rate, regardless of what day of the week or what time of the day the travel actually occurs. Eight (8) hours will be billable per normal work day even if the field service engineer is directed or requested to stand by locally. The overtime rate is 1.5 times the normal work day rate or $255 per hour. Overtime is defined as any work performed in excess of eight (8) hours during any work day and all hours worked on Saturdays and Sundays. The overtime rate applies to all work performed <u>except</u> Sundays, New Year's Day, Memorial Day, Independence Day, Thanksgiving Day and Christmas Day. Two (2) times the normal work day rate or $340 per hour applies to all hours worked on Sundays and those specific holidays.

For extended assignments, i.e., durations in excess of three (3) months, the service engineer shall be entitled to home leave every five (5) weeks. Home leave shall include four (4) days off, i.e., two working days and two weekend days. All travel and living expenses, as well as, other miscellaneous expenses, will be billed at actual cost. These costs shall include airfare, meals, car rental, hotel, etc.

Payment shall be 30 days upon receipt of invoice. Invoicing shall be on a monthly basis. This offer is valid for a period of sixty (60) days from this date. ABB Inc. "General Terms and Conditions of Sale" apply to this offering. A copy is attached to this document.

ABB Inc. requires a minimum of thirty (30) days advance notice of actual dates for which service is required in order to assure that appropriate resources are allocated and assigned. ABB Inc. will make every reasonable effort to accommodate accelerated needs, schedule changes and to respond to emergency "on demand" requests for site service.

ATTACHMENT 3
REFERENCE LIST FOR ABB INC. SAFE FLAME™ DFS FLAME SCANNER SYSTEMS

Contact	Utility and Plant(s)	Application/Fuel
Kevin Williams 563-262-2888	MidAmerican Energy Louisa Installed 2002	B&W Opposed Wall Coal w/oil & gas lighters
Jim Parsons 816-556-2162	Kansas City Power and Light Iatan Installed 2000	B&W Opposed Wall Coal with oil lighters
Jack Dabbs 770-854-4441 x464	Georgia Power Plant Wansley Installed 2001	T-Fired Coal
Ron Wolfe 270-844-6035	Western Kentucky Energy Greene #2 Installed 2001	B&W Opposed Wall Coal w/oil lighters
Ed Hutchins 405-553-5245	Oklahoma Gas & Elec. Mustang/Horseshoe Lake Installed 1999 and 2000	Wall, T-Fired, GT Gas
Art Bocchino or Bill Smith 319-262-3588	Muscatine Power and Water Unit 8 Installed 2000	Cyclone, TFired Coal
Travis Ray 970-229-1697	Platte River Power Authority Installed 2000	T-Fired Coal
Richard Winkler 314-554-4214	Ameren Sioux Plant Installed 1999	Cyclone Coal
Gary Dove 505-537-4119	Phelps Dodge Units 7 & 8 (1x1 and 3x3) Installed 1998	Wall Gas
Ross Childs	Western Resources, Gordon Evans Unit 2	Wall

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316-291-8666	Installed 1998	Gas/Oil
Mario Amaya 210-978-3629	CPS San Antonio, Victor Braunig 1,2, 3 Installed 1998	T-Fired Gas/Oil
Grant Nurnberg 918-581-0842	P.S. Oklahoma Northeastern Station Installed 1996, 1997	T-Fired Coal
Jim Clark 516-391-6123	Long Island Lighting Co. Barrett Station Installed 1994, 1997	T-Fired Oil/Gas
Brad Zimmerman 701-873-2571	Montana-Dakota Utilities Coyote Station Installed 1997	Cyclone Coal
Gary Hausman 610-498-6247	Pennsylvania P&L Martins Creek Installed 1995	T-Fired Oil/Gas
Harold Edwards 913-331-4700	Western Resources Lawrence Station Installed 1994	T-Fired Coal/Gas
Mickey Kinney 816-325-7516	Independence P&L Blue Valley Station Installed 1994	T-Fired Coal/Oil/Gas
Stan Saska 860-848-6018	Northeast Utilities Montville Station Installed 1994	T-Fired Oil
Frank Lyter 610-774-6046	Pennsylvania P&L Brunner Island Installed 1993, 1994	T-Fired Coal

11/15/02

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ABB INC.
Utility Plant Automation
2 Waterside Crossing
Suite 200
Windsor, CT. 06095
Fax: (860) 285-6999

ATTACHMENT 4 - Spare Parts Listing for SafeFlame Fiber Optic DFS Scanner Systems
Plant: Intermountain Power
Proposal Number U030304

Description	Part No.	Unit Price
Head Assy (wide viewing angles)	C10-97248	$ 226.00
Collimator Tube	C65-91960	$ 78.00
Body (wide viewing angles)	C63-97311	$ 99.00
Lens (Visible Light)	C35-90398	$ 26.00
Spacer (9840475)	C65-91966	$ 14.00
Lens Barrel Assembly (9 degree)	C10-97326	$ 291.00
Mounting Plate	C52-91948	$ 40.00
Compression Spring (wide viewing angles)	C68-10317	$ 13.00
Jam Nut	C08-95061	$ 1.60
Plug	C65-91967	$ 62.00
Fiber Optic Cable, hi temp 110"	C99-94501	$ 244.00
Scanner Flex Hose, 72"	C64-97256	$ 126.00
Housing Electronics Card Visible Light (Replaces C87-92525 & C10-97261)	C10-24112	$ 490.00
Electrical Connector Gasket	C69-97363	$ 3.55
Connector/Cable assembly, 50 ft	C10-97252-50	$ 352.00
Connector w/pre-wired header Replaces (C36-92130)	C36-92146	$ 72.00
Protector Plate	C63-97260	$ 18.00
Screws 8-32x0.19 (bag of 5)	C08-95192	$ 5.20
Sensor Module Assembly	C86-94639	$ 1,010.00
Sensor Relay/Board	C86-94644	$ 870.00
Display Board	C86-94612	$ 175.00
Power Supply 110/220Vac	C86-80741	$ 800.00
Fuse 4 Amp	C32-32012	$ 4.20

SAFE FLAME™ DFS FIBER OPTIC SCANNERS FOR: WALL FIRED OR TILTING TANGENTIAL FIRED COAL BOILERS

SAFE FLAME™ DFS TECHNOLOGY

Flame Scanners are a crucial part of a boiler's safety system. Their primary function is to identify potentially dangerous "flame out" conditions where ignition has ceased and continued addition of fuel could cause an explosion. Because of the flame scanner importance, they must be extremely reliable and rugged.

Safe Flame™ technology has been reliably in use since 1982 with over eleven thousand (11,000) scanners installed. Safe Flame™ DFS is the newest generation of this technology. It incorporates the speed and precision of digital signal processing, which makes it the finest flame scanner available.

SAFE FLAME™ DFS FLAME SCANNER SYSTEM DESCRIPTION

All Safe Flame™ DFS Flame Scanner Systems have four major components.

1. Flame scanner mounting hardware which is affixed to the burner front

2. Flame scanner head, which mounts on the burner/windbox. The scanner head converts the light energy from the burner flames into electrical signals.

3. A quick disconnect electrical connector/cable assembly transmits the analog scanner signal to a flame scanner electronics chassis. If the chassis is located more than 100 feet from the scanner head a local junction box is used for spicing to flame scanner extension cable.

4. The Safe Flame™ DFS Scanner Chassis holds the system power supply and the microprocessor based DFS flame sensor modules. The electrical signal from each flame scanner head is monitored and analyzed by a DFS Flame Sensor Module, which determines if the flame scanner is seeing a stable flame. Flame safety contacts, analog outputs, and digital outputs are all made available to the boiler operators from terminal strips on the backplane of the Safe Flame™ DFS chassis.

A typical scanner installation is shown in Figure 1.

FLAME SCANNER FOR PULVERIZED COAL FIRING

The recommended ABB Inc. flame scanner for pulverized coal applications is the Safe Flame™ visible light, through the windbox fiber optic scanner. On wall-fired boilers where flame discrimination is required, a wide viewing angle lens is used. A ridged guide pipe is supplied for penetration into the wall-mounted burner. On a tilting tangential fired unit a narrow viewing

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angle lens is used to discriminate warm up oil guns and prove coal fireball flame. On tilting tangential fired units the scanner guide pipe is flexible to allow the scanner to tilt up and down with the corner burners. All other scanner and system components are the same.

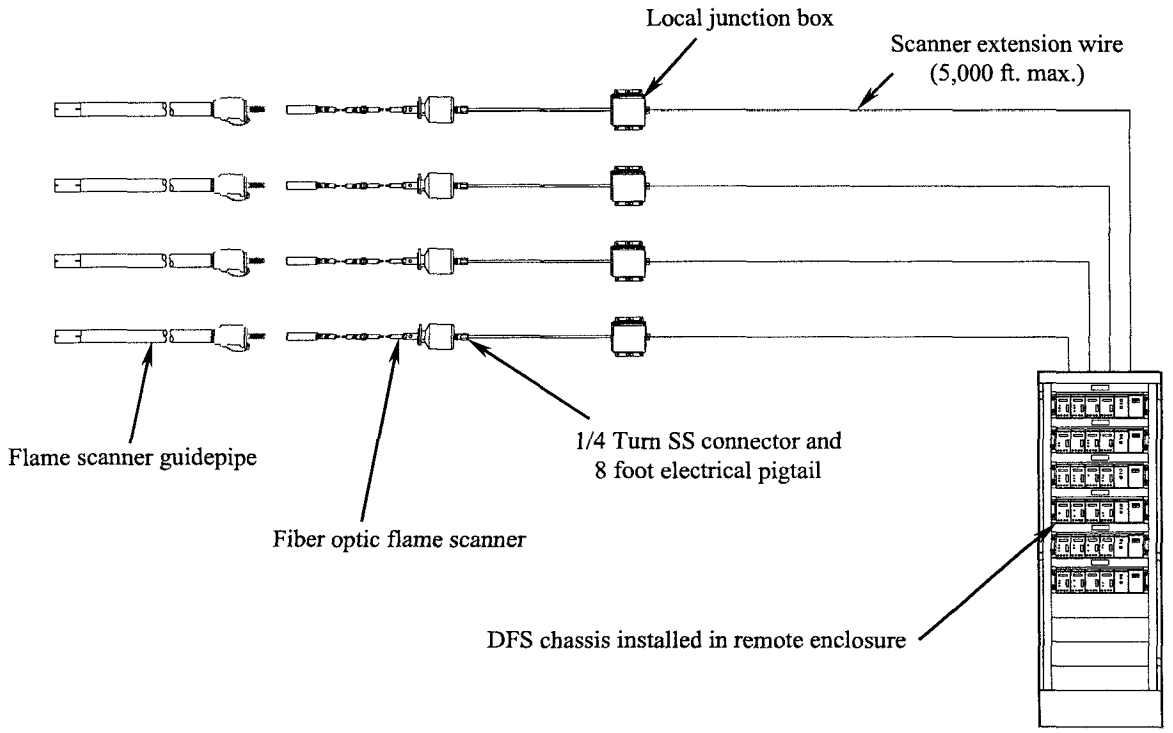

Figure 1 – Typical Flame Scanner Installation

FLAME SCANNERS FOR CYCLONE BURNER

For cyclone burners the ABB SafeFlame™ wall mounted fiber optic flame scanner is recommended. Cyclone burners are notorious for the extreme temperatures on and immediately adjacent to the burners making scanner survival difficult, even for the most rugged scanners. To accommodate these high temperatures the SafeFlame™ wall mount fiber optic scanner uses a high temperature fiber optic cable to allow the scanner electronics to be removed away from the cyclone. Fiber cables are available in 110"or 360" (30 foot) lengths.

THROUGH THE WINDBOX FIBER OPTIC FLAME SCANNER ASSEMBLY

The ABB Inc. Safe Flame™ through the windbox fiber optic flame scanner is a rugged, high temperature flame scanner designed for use on coal and/or oil wall fired boilers. This multi-fuel scanner reliably discriminates individual burner flames over background radiation and detects unstable operation and flame out conditions.

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The scanner is a visible light scanner and is available with different viewing angles to accommodate the firing of pulverized coal, oil or a combination of both fuels. The purpose for fiber cable is to allow the focusing lens to be brought closer to the burner front allowing an unobstructed field of view for the scanner. On wall-fired boilers this allows the scanner optics to focus on the near field burner flame while averaging out the light pulsations created from background flames. This combination of fiber optics and lensing provides unsurpassed flame discrimination capabilities. On tangential fired boilers, a narrow viewing angle lens is used to allow the scanner to look deep into the furnace, providing strong fireball flame flicker frequency even at low load operation. As with all Safe Flame™ scanners, the Fiber Optic Flame Scanner has been ruggedly designed for years of reliable service in the power plant environment. Refer to Figure 2.

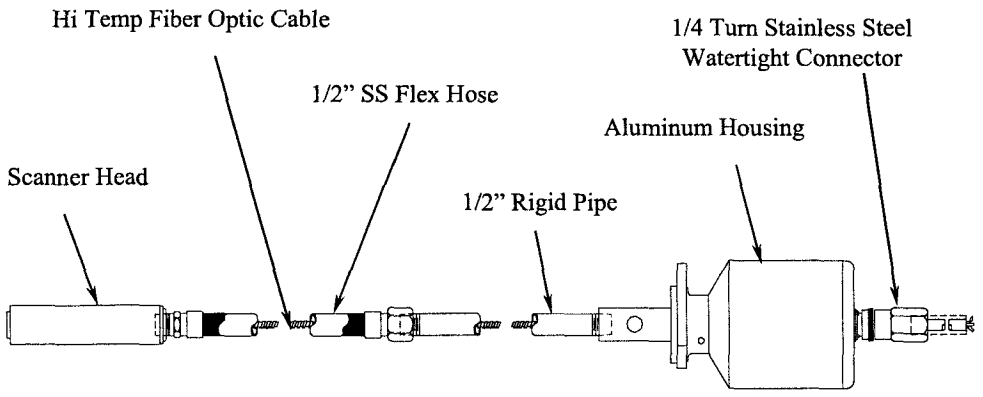

Figure 2 – Safe Flame™ Wall Fired Fiber Optic Scanner

The scanner stainless steel optical head houses a lens assembly that couples the light energy from an oil or coal flame into a high temperature fiber optic cable. Refer to Figure 3. The fiber optic cable assembly consists of a fiber bundle encapsulated in a 3/8" stainless steel over-braid flex jacket. The fiber optic cable is installed in a ½ inch outer stainless steel flex hose and ½ inch schedule 40 pipe connected to a rugged cast aluminum housing. The fiber optic cable is terminated at a photodiode/electronics card mounted in the aluminum housing. The scanner stainless steel optical head assembly is rated for 900 °F (480 °C) operation, whereas the signal conditioning aluminum housing is rated at 140 °F (60 °C).

All scanners are supplied with a standard length fiber optic cable. Changing the length of the flex hose and the ridged pipe sets the overall length of the scanner assembly. No special length fiber cable is required as excess fiber cable is simply coiled inside the aluminum housing. This makes scanner spare parts compatible between plants.

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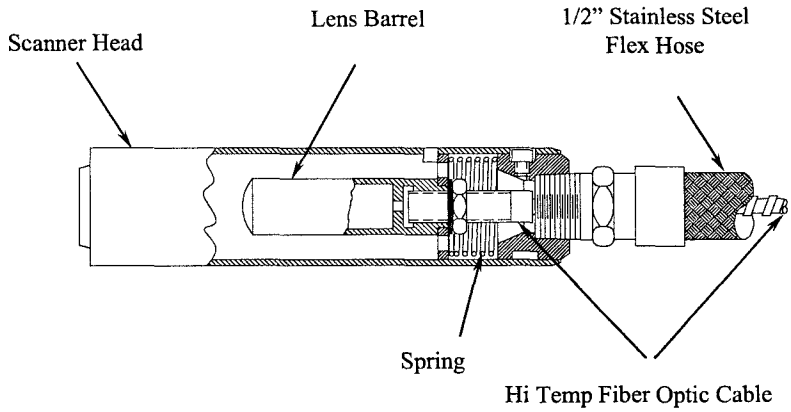

Figure 3 - Details of Scanner Head

The fiber optic cable transmits the light from the optical head to a photodiode/electronics card, which converts the collected light energy into an electrical flame signal. The photodiode circuit has a dynamic light range of 10^5 that makes the scanner very sensitive to combustion flame throughout the entire operating range of the burner.

Refer to Figure 4 for a typical installation in a coal-fired wall burner. Refer to Figure 5 for a tilting tangential fired burner installation.

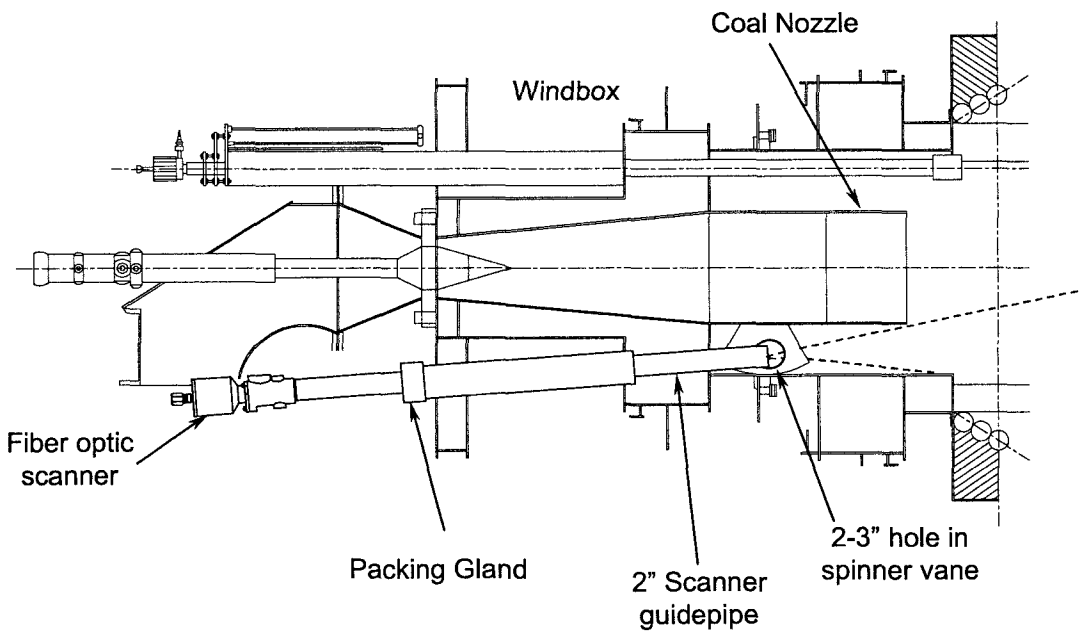

Figure 4 – Typical Fiber Optic Scanner Installation – Wall Fired Burner

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Installation of the Fiber Optic Flame Scanner is accomplished by inserting the scanner down the flexible or ridged guide pipe, which is installed through the burner windbox. Once installed in the guide pipe the scanner head has excellent visual access to the combustion flame. The end of the guide pipe has a cooling air inlet tee for purge/cooling air. Nominally 30 SCFM at 6" WG is recommended to keep the guide pipe free and clear of slag or ash and keep the scanner head cool.

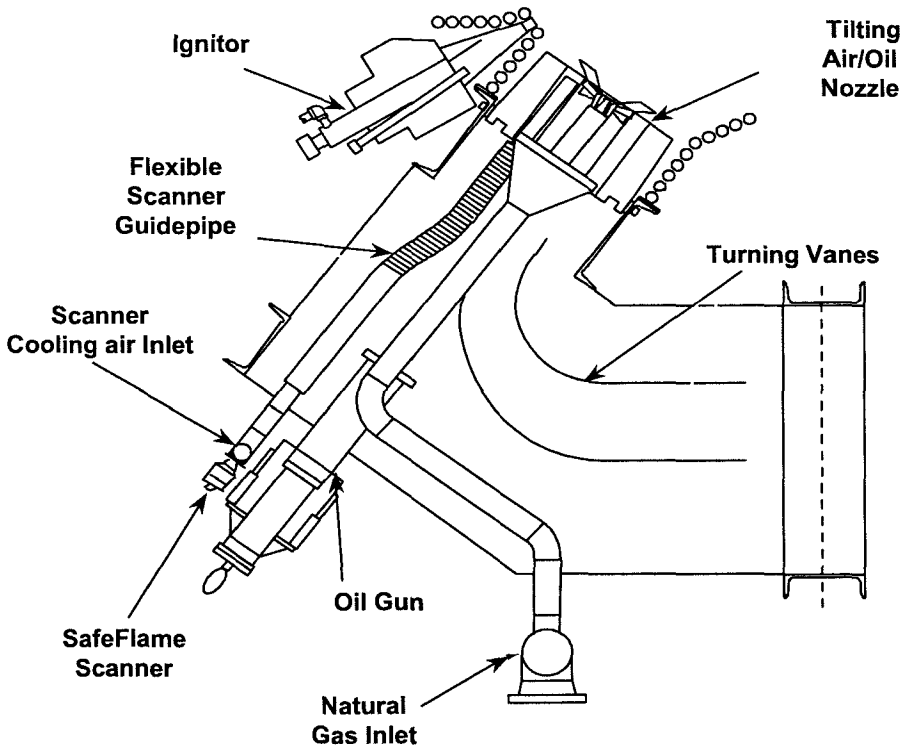

Figure 5 – Typical Fiber Optic Scanner Installation – T-Fired Burner

WALL MOUNTED FIBER OPTIC SCANNER

As noted above, the SafeFlame™ wall mounted fiber optic scanner is recommended for cyclone burners due to the high temperature at the cyclone. This scanner uses the same fiber optic cable, lens, electronics board, and connector as the through the windbox scanner allowing for compatibility of spare parts. An optional 30-foot fiber optic cable is available for those installations where it is desirable to remote the electronics even further from the cyclone. Refer to Figure 6.

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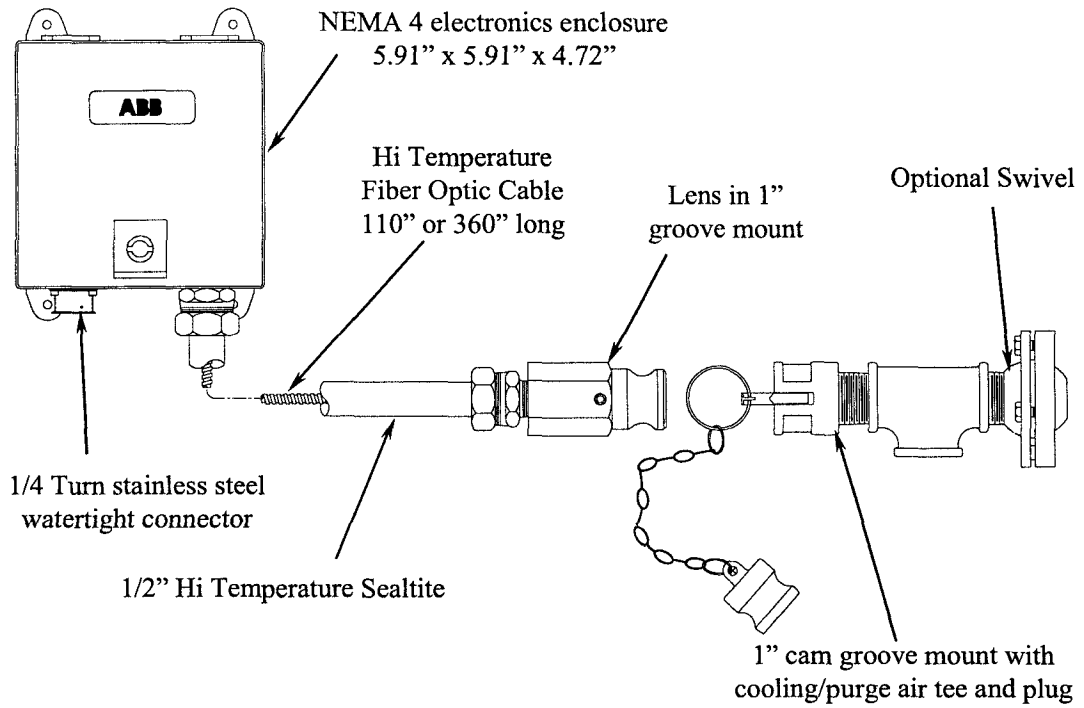

Figure 6 –Wall Mount Fiber Optic Scanner for Cyclones

FLAME SCANNER ELECTRICAL CONNECTOR/CABLE ASSEMBLY

For ease of maintenance all Safe Flame scanner heads have a bayonet style 5-pin connector. To insure long-term reliability the electrical connections are potted at the factory. Standard cable lengths from the connector are 8', 25', 50', and 100'. The other end of the cable (or "pigtail") has bare wires for connection to scanner extension wire in a junction box, or connection to a Safe Flame™ chassis. Where the cable exits the connector there is a ½" FNPT thread so the "pigtail" can be installed in liquid tight, flexible electrical conduit.

SAFE FLAME™ DFS ELECTRONICS CHASSIS

All Safe Flame scanner heads produce an analog current signal that is input into a remotely mounted Safe Flame™ DFS Electronic chassis. The chassis can be mounted up to 5,000 feet from the flame scanner. The DFS chassis holds the power supply, the scanner Sensor Modules, an optional 2/4 logic module, and the field terminal strips for system I/O. The scanner system AC power, flame scanner input signals, sensor module flame contacts, analog, and serial outputs signals are all distributed through the chassis backplane and are available on the field terminal

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strips. Each scanner heads requires one DFS Sensor Module and one chassis can support up to four DFS Sensor Modules.

A four-channel rear DFS Electronics Chassis is illustrated in Figure 7. It can be seen that four DFS Sensor Modules, an optional 2/4 Logic Module and a Power Supply Module are "plugged" into a 19" rack with a back plane. The setup is designed to be modular to ease serviceability by technicians.

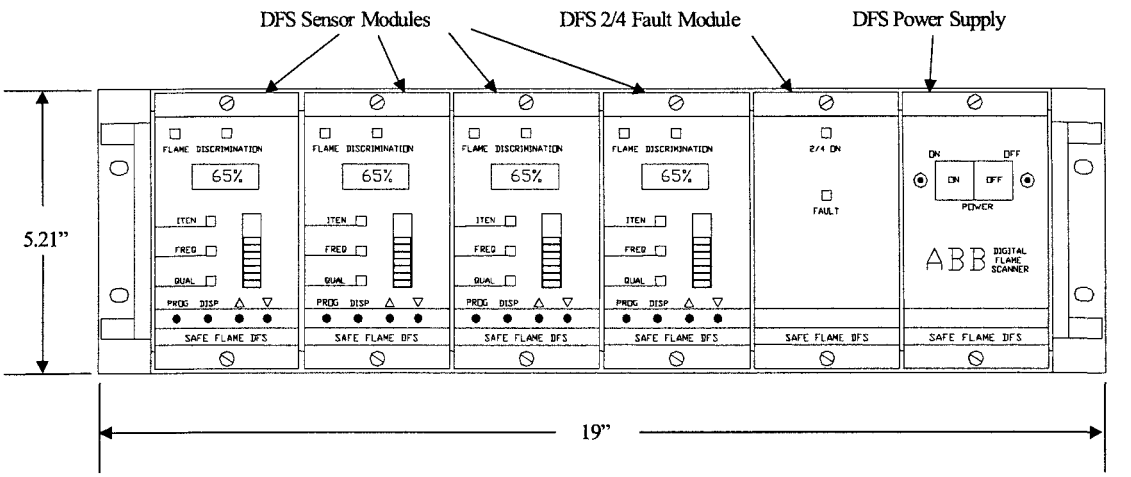

Figure 7 - Safe Flame™ DFS Rear Access, 4 Channel Chassis

Safe Flame DFS scanner chassis are available in front access or rear access design. With the rear access design the chassis is 19" rack mounted with field terminations at the rear of the chassis. A front access chassis is twice as high (10.5"), panel mounted, with access to the field terminations from the front of the chassis. The field terminals face the front and are covered by an aluminum fold down door. One either side plate is a 3" diameter opening for wire feed to the terminals. Refer to Figures 8 and 9 for photos of a rear and front access chassis.

OPERATION

The Safe Flame™ DFS Sensor Module is self-checking 10 times per second, from initial power "on" through normal operation. If no faults are detected, the previously programmed user trip points are loaded in from non-volatile memory and normal operation begins. If any failures are detected, a fault condition is generated.

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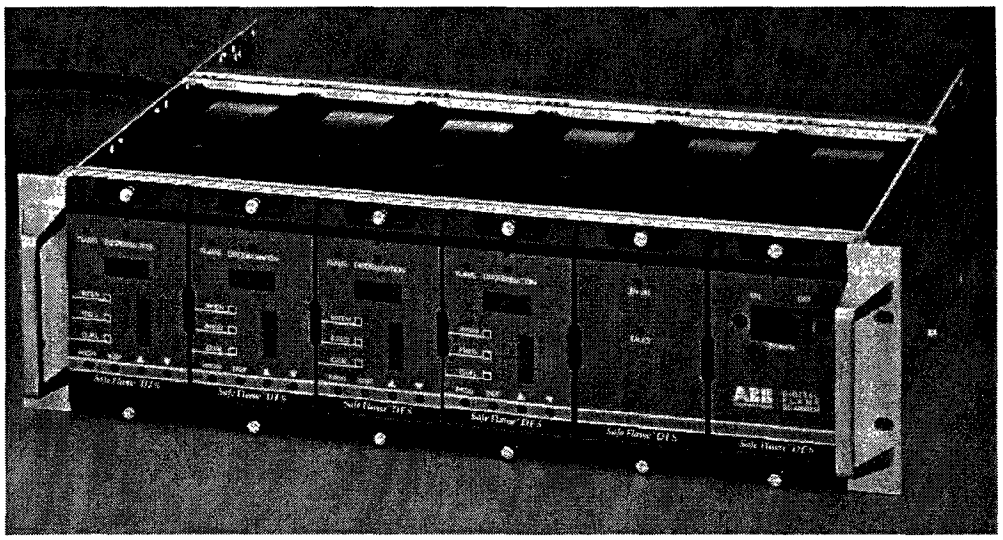

Figure 8 – Rear Access Safe Flame DFS Chassis

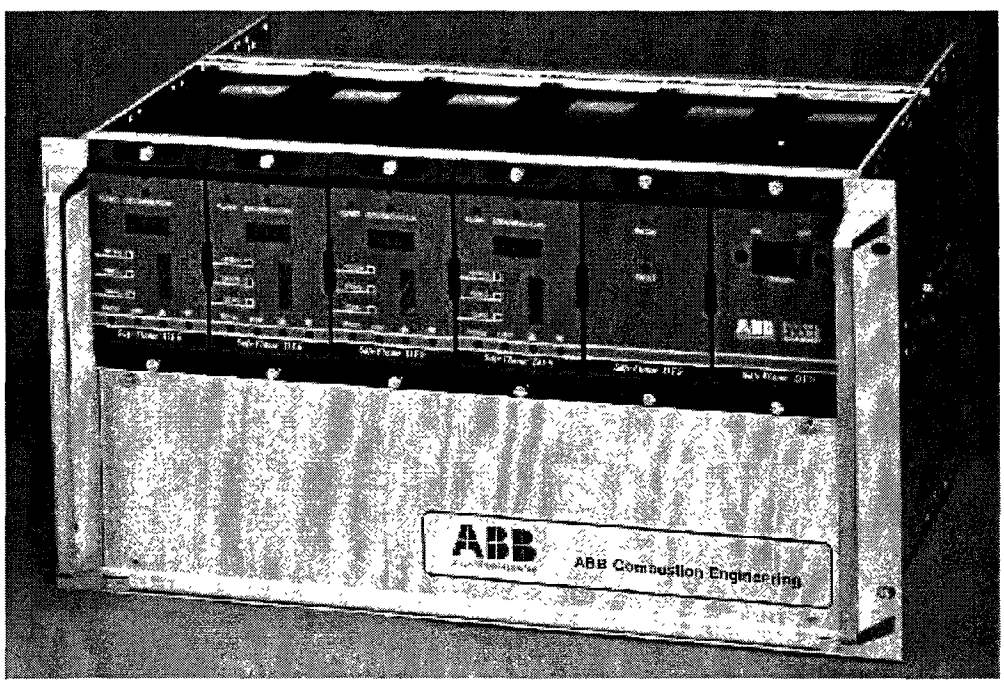

Figure 9 –Front Access Safe Flame DFS Chassis

The scanner head transmits the flame signal to the microprocessor in the DFS Sensor Module. The Sensor Module examines the flame signal two thousand (2,000) times a second, measuring the flame intensity and flame flicker frequency. The measured intensity and flicker frequency are compared to user programmed trip points. If both the intensity and frequency exceed their respective trip points, flame is proven and the flame relay is energized. The flame scanner trip

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points are determined during initial system tuning and programmed using easy to follow prompts. Sophisticated proprietary software is used to extract the flame flicker frequency and intensity information.

If either the measured flame flicker frequency or the measured intensity drops below the programmed trip points for more than the user settable time-delay period, the flame relay (and the TTL flame signal) will de-energize indicating a flame failure.

A second relay is provided on the DFS Sensor Module. A hardware jumper sets the function of this relay. It can be used as a second, independently programmed flame relay, or can be used as a fault relay. If the relay is used for fault indication it will be energized whenever the system is working correctly. If any system fault is detected the relay is de-energized and both a fault code and a short message are displayed on the front panel. If used a second flame relay it will energized when the flicker frequency and intensity both exceed the second set of trip points programmed into the DFS Sensor Module.

An optional 2/4 Module is available for installation in the DFS chassis. This module has 2 relays that are output to the back plane terminal strips. If two of the four DFS Sensor Modules in the chassis are proving flame one of the relays will energize. This relay output is typically used for fireball flame monitoring control logic on tilting tangential fired boilers. The second relay is a fault relay and is normally energized. If any DFS Sensor Module in the chassis goes into a fault mode this relay will de-energize as an operator warning.

SENSOR MODULE COMMUNICATION SERVER (OPTION)

Each DFS sensor module has an RS-232 output that carries over 25 pieces of information on the scanner. Function settings, fault status, operating parameters, and channel identifiers are all available through this serial output. A connector on each DFS chassis has all 4 RS-232 signals from each Sensor Module in the chassis.

The Safe Flame™ Sensor Module Communication Server (SMCS) is a sample hold digital multiplexor that can be connected via ribbon cables to six DFS chassis. Once per second the SMCS samples each DFS Sensor Module and stores all data available on the serial line.

A switch selectable serial output on the SMCS (RS-232 or RS-485) is configured as a MODBUS® slave and can be plugged into a DCS, BMS, or personal computer. MODBUS® commands are issued from the host to selectively download data for operator display. If a personal computer is used, ABB Inc. offers a data display, trending, and programming package called ***Flame Explore*** for use with Safe Flame DFS scanner system.

IP7_031119

A typical SMCS configuration is shown in Figure 10.

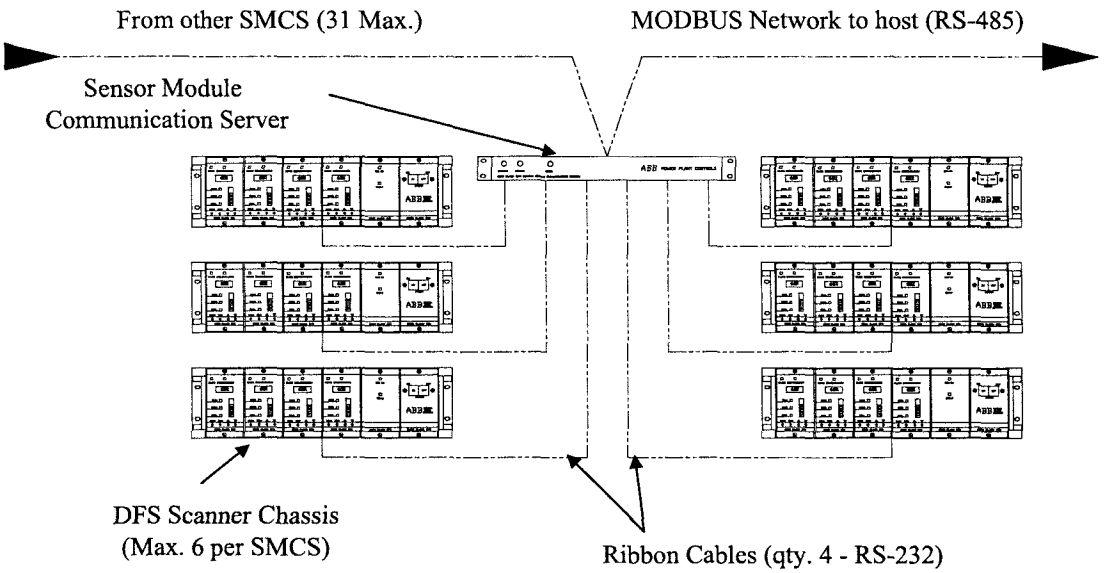


Figure 10 –SMCS Configuration

FLAME EXPLORER SOFTWARE (OPTION)

ABB Inc. offers an optional flame scanner data trending and archiving software package that runs on a personnel computer connected to one or more SMCS. This package, called ***Flame Explorer***, can be used to assist plant personnel in initial setup of the scanner system and monitoring during routine operation. The package can be used on a single SMCS (up to 24 scanners) using the RS-232 output or can be used with multiple SMCS daisy chained together using the RS-485 output.

Flame Explorer allows the user to trend in real time, the two measure parameters (DC intensity and Flicker Frequency) for each scanner. One to four scanners can be displayed simultaneously and are selected using simple drop down boxes. Data from any or all of the scanners can be archived using a simple channel selection sheet. Although the software is not required for scanner set-up, it can be used to remotely configure each scanner or a group of scanners. An ID password installed in the software and a hardware jumper on the Safe Flame DFS sensor module locks out programming capability to keep unqualified personnel from adjusting the flame scanners. Figures 11 and 12 show some of the screens available with ***Flame Explorer.***

IP7_031120

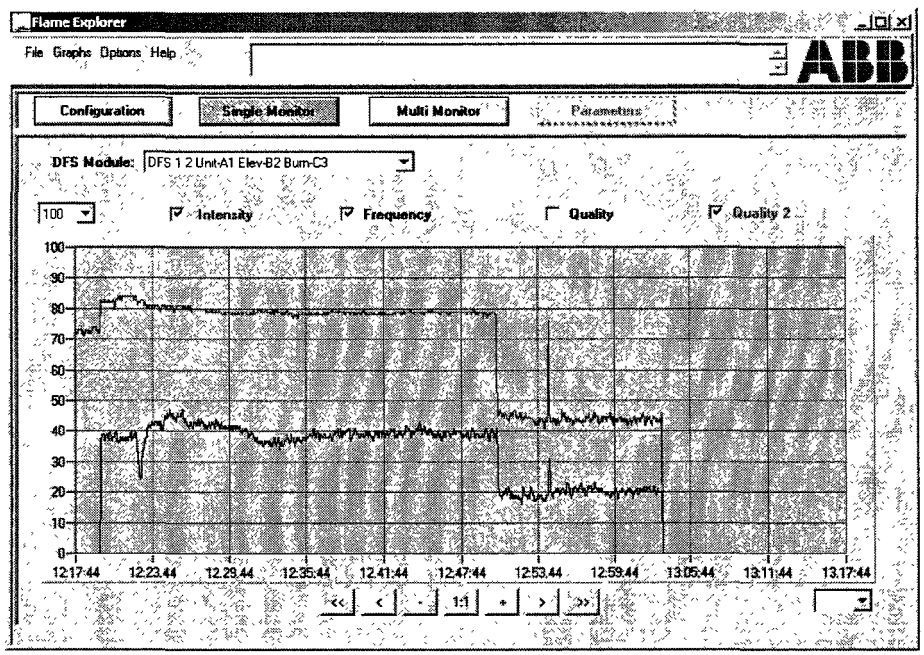


Figure 11 – Trend graph for one flame scanner

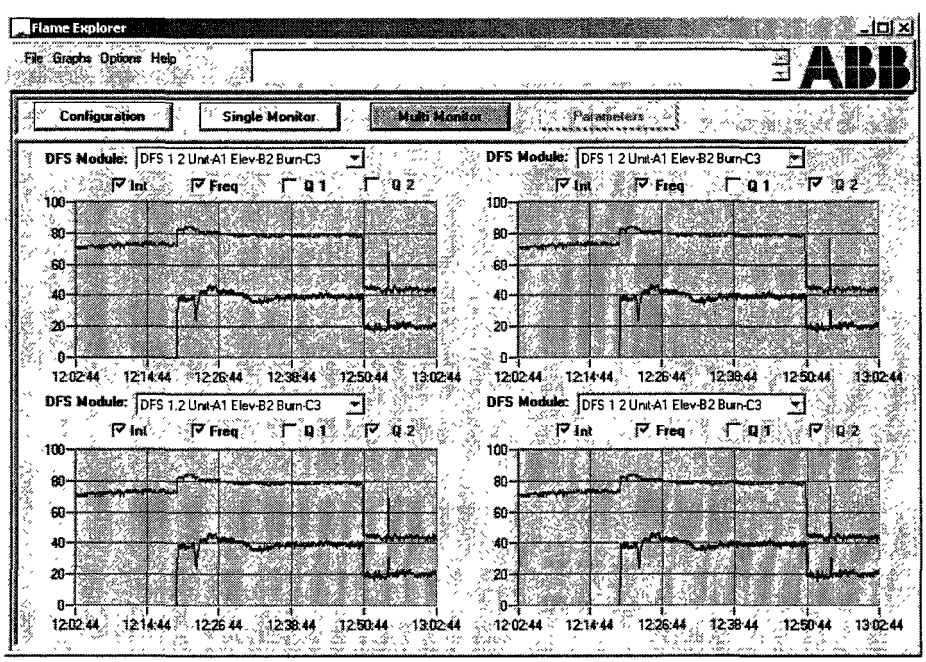


Figure 12 – Trend graph from four flame scanners

GENERAL SPECIFICATIONS

Safe Flame™ DFS Chassis and Power Supply

- Environmental: 0 to 60°C (32°F to 140°F) non-condensing
- Chassis Input Voltage: 120/240 (+10%) VAC @ 45 to 65 Hz
- Power Input Protection: Metal oxide varistor/input circuit breaker/fuse
- Chassis Mounting Position: Restricted to horizontal position, canted position prohibited

Safe Flame™ DFS Sensor Module

- Environmental: 0 to 60 °C (32 °F to 140 °F) non-condensing
- Microprocessor: Motorola MC68HC11E1FN (2M Hz)
- A/D Converter: 12 bit, 2000 Hz sample rate w/10μ second settling time
- Visual Outputs: 10 Element LED Bar and
  4 Character Alpha-Numeric Display
- Contact Outputs: Qty 2, Form C
- Contact Rating Switched Load: 2 A Maximum
  500 V Maximum
  100 VA Maximum
- Contact Rating Inrush Current: 20 A for 10 microseconds
  4 A for 10 seconds
  2 A for 100 seconds
- TTL Outputs: Qty 3, Open Collector
- Digital Output: RS-232, VT100 Terminal Compatible
- Analog outputs: Qty 2, Isolated 4-20 ma, non-isolated 0–1 ma
- Digital Output: RS-232, VT100 Terminal Compatible
- Analog outputs: Qty 2, Isolated 4-20 ma, non-isolated 0–1 ma

Safe Flame™ DFS 2/4 and Chassis Fault Module (optional)

- Environmental: 0 to 60 °C (32 °F to 140 °F) non-condensing
- Contact Outputs: Qty 2, Form C
- Contact Rating Switched Load: 2 A Maximum
  500 V Maximum
  100 VA Maximum
- Contact Rating: Inrush Current: 20 A for 10 microseconds
  4 A for 10 seconds
  2 A for 100 seconds

IP7_031122

Through The Windbox Fiber Optic Flame Scanner

- Electronics Ambient Temp: -18 to 60° C (0 to 140 °F)
- Fireside Scanner Head Temp: 482° C (900 °F)
- Nominal length: 33 to 126"
- Max Diameter: 5"
- Purge/Cooling air: 30 SCFM @ 6" wg
- Mounting: Twist lock to end of 2" guide pipe
- Electrical Supply: +/- 15 Vdc, nominally 100 ma
- Output: 0 to 2 ma
- Dynamic light range: 10^5 fixed
- Connector: Stainless Steel ¼ turn connector with ½" NPT
- Photodiode: Visible light or Infrared
- Photodiode Response Range: Visible light - 450 to 700 nm, Infrared - 700 to 1100 nm
- Fuels: Oil, Coal or any combination of the two

Wall Mount Fiber Optic Flame Scanner (Cyclones)

- Electronics Ambient Temp: -18 to 60° C (0 to 140 °F)
- Fiber Optic Cable Max Temp: 482° C (900 °F)
- Lens O-ring Max. temp: -54 to 232° C (-65 to 450° F)
- Nominal length: -54 to 232° C (-65 to 450° F)
- Fiber cable length: 110" or 360"
- Purge/Cooling air: 6-10 SCFM
- Mounting: 1" cam groove
- Electrical Supply: +/- 15 Vdc, nominally 100 ma
- Output: 0 to 2 ma
- Dynamic light range: 10^5 fixed
- Connector: Stainless Steel ¼ turn connector with ½" NPT
- Photodiode: Visible light or Infrared
- Photodiode Response Range: Visible light - 450 to 700 nm, Infrared - 700 to 1100 nm
- Fuels: Oil, Coal or any combination of the two

IP7_031123

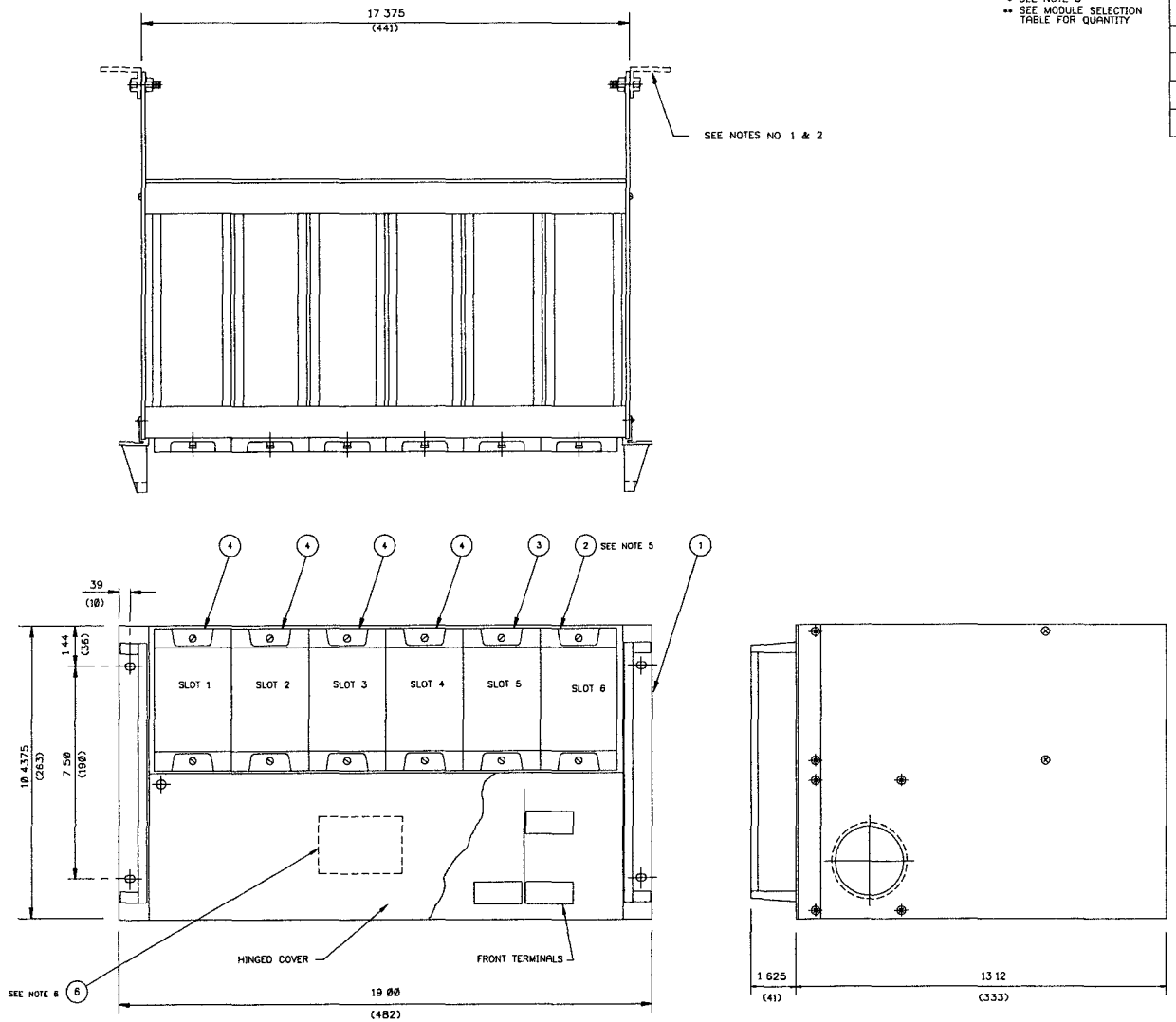
Contact

For additional information, pricing, and delivery contact your local ABB representative or:

ABB Inc.
Utility Plant Automation
2 Waterside Crossing
Suite 200
Windsor, CT. 06095

Mr. Jim Niziolek
Product Manager, Boiler Sensors
Phone: 860-285-6775
E-mail:james.m.niziolek@us.abb.com

IP7_031124



* SEE NOTE 3
** SEE MODULE SELECTION TABLE FOR QUANTITY

ITEM NO	QTY	PART NUMBER	DRAWING NO	DESCRIPTION
1	1	C13-94598	D-20-0-1101	FRONT ACCESS CHASSIS SUB-ASSEMBLY
2	1	C86-80741	B232655-014	POWER SUPPLY MODULE
3	**	C86-80742	B232655-015	2/4 FLAME AND FAULT ALARM MODULE
4	**	C86-94639	B232655-016	SENSOR MODULE
5	*	C86-80739	D232656-005	BLANK MODULE
6	1	C66-92834	B232656-030	DATA PLATE

SEE NOTE 4

CHASSIS PART NO & BLANK MODULE SELECTION TABLE

TYPE	ASSEMBLY PART NO	REQ'D ITEM 3	SLOT LOCATION	QTY ITEM 4	SLOT LOCATION	QTY ITEM 5	SLOT LOCATION
1	C13-94506	1	5	4	1,2,3,4	NONE	NONE
2	C13-94506-220	1	5	4	1,2,3,4	NONE	NONE
3	C13-94507	0	——	4	1,2,3,4	1	5
4	C13-94507-220	0	——	4	1,2,3,4	1	5
5	C13-94508	0	——	3	1,2,3	2	4,5
6	C13-94508-220	0	——	3	1,2,3	2	4,5
7	C13-94509	0	——	2	1,2	3	3,4,5
8	C13-94509-220	0	——	2	1,2	3	3,4,5
9	C13-94510	0	——	1	1	4	2,3,4,5
10	C13-94510-220	0	——	1	1	4	2,3,4,5
11	C13-94511	1	5	3	1,2,3	1	4
12	C13-94511-220	1	5	3	1,2,3	1	4

NOTES

1 FOR BACK PANEL MOUNT (INSTEAD OF RACK MOUNTING AS SHOWN) ADD (2) VERTICAL PROFILE, ELMA #66-175-36, (8) M4X10 SCREWS, ELMA #1904-12, (8) M4 HEX NUTS ELMA #1907-90, MOUNTING KIT PART NO C13-94624

2 REAR PROFILE MOUNTING HOLES SAME AS FRONT PROFILE (ITEM NO 1)

3 IF BLANK MODULES ARE REQUIRED SEE THE BLANK MODULE SELECTION TABLE ABOVE FOR ITEMS 4, 5 AND 6 QUANTITIES AND LOCATIONS

4 UNLESS SPECIFIED OTHERWISE, A TYPE 1 CHASSIS, *P/N C13-94506, IS THE STANDARD FRONT ACCESS* CHASSIS SUPPLIED FOR USE ON TANGENTIAL FIRED BOILERS

5 SWITCH ON POWER SUPPLY PC BOARD ENABLES 115V OR 230V OPERATION

6 CENTER DATA PLATE ON INSIDE COVER SO INFORMATION CAN BE READ WITH COVER DOWN

REF DWG

EXTERNAL CONNECTION DIAG FRONT TERMINALS - D-20-0-0118

SAFE FLAME™ DFS
FINAL CHASSIS ASSEMBLY FRONT ACCESS

-STANDARD-

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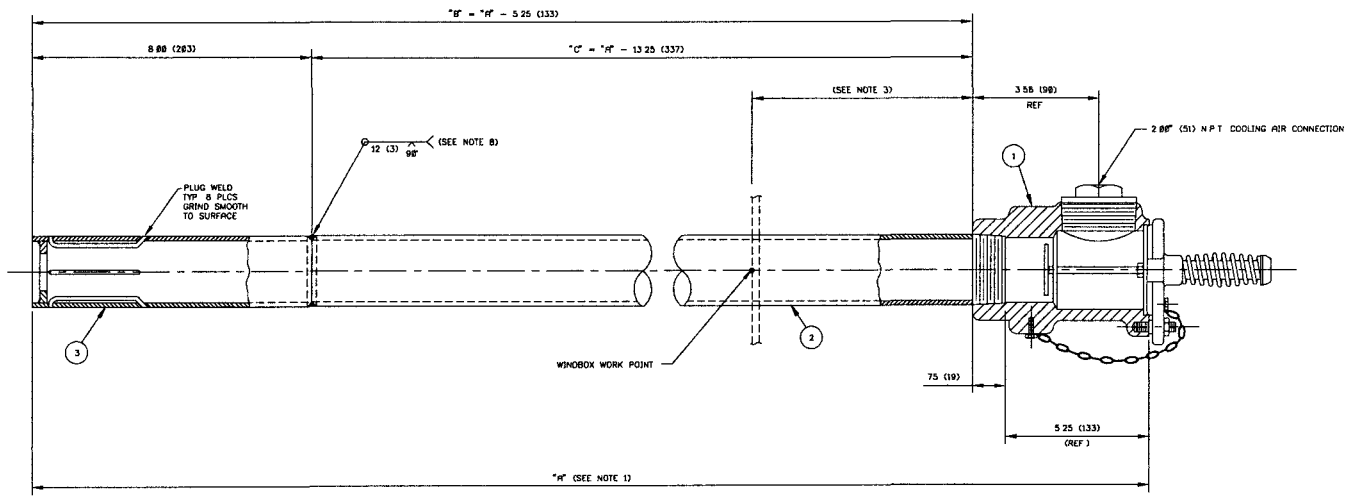
REV	DATE	CHK'D	APPV'D	REVISION NOTE
12	12/4/01	SUT	PHC	CHANGED POWER SUPPLY MODULE
13	6/5/02	SUT	PHC	CHANGED SELECTION TABLE
14				
15				
16				

DRAWING SCALE NONE — PLOT SCALE 1 1
PROJECT NUMBER STANDARD
DRAWING NUMBER D-20-0-1100 — REV 13

CE, TÜV, OR CSA SENSITIVE

IP7_031125

ITEM	NO REQ'D	PART NO	DWG NO	DESCRIPTION	MAT'L SPEC
1	1	C68-07441	———	COOLING AIR MANIFOLD ASSEMBLY	———
2	1	902-2491-AB	———	2.00" (51) SCH 40 PIPE (T.O.E. 2.00" (51) N.P.T.) "C" = "A" – 13.25" (337)	154
3	1	902-0385-AA	———	GUIDPIPE SCANNER BODY HOUSING	———



NOTES:

1. FOR "A" DIMENSION SEE WINDBOX OR BURNER ARRANGEMENT DRAWING. DIMENSION "A" NOT TO EXCEED 106.44" (2784)
2. "L" DIMENSION ON FLAME SCANNER ASSEMBLY EQUALS "A" + .38" (10)
3. PREFFERED LENGTH IS 13.81" (351) OR LONGER. MINIMUM LENGTH TO BE 7.81" (198)
4. QUANTITIES LISTED ABOVE ARE FOR ONE FLAME SCANNER GUIDE PIPE ASSEMBLY
5. PAINT IN ACCORDANCE WITH SHOP PAINT STANDARD DRAWING C-985-0671 ITEM NO 9.0
6. APPLY FEL PRO C-100 HI-TEMP ANTI SEIZE OR EQUAL TO ALL THREADS AT ASSEMBLY
7. THE COOLING AIR SUPPLY FROM IGNITOR OR SEAL AIR SYSTEM MUST BE MAINTAINED GREATER THAN 4.00" (102) W.G. ABOVE FURNACE PRESSURE FOR ALL OPERATING CONDITIONS
8. INTERNAL & EXTERNAL AREA OF WELD TO BE GROUND SMOOTH AND FREE OF WELD
9. ALL DIMENSIONS ARE SHOWN IN INCHES WITH MILLIMETER EQUIVALENT IN PARENTHESES (---)

MATERIAL SPECIFICATION CHART

MATERIAL	SPECIFICATION	PURCHASE INSTRUCTION
154	CARBON STEEL A-120	———
213	MALLEABLE IRON A-197	———
272	CARBON STEEL ASTM A-569	———
297	CARBON STEEL A-307	———

ASSEMBLY NO 902-2491-AA

FLAME SCANNER GUIDE PIPE ASSEMBLY
FOR FLAME SCANNER

-STANDARD-

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WINDSOR, CONNECTICUT U.S.A. 06095

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REV	DATE	CHK'D	APPR'D	REVISION NOTE
00	4/4/93	CG	JR	INITIAL ISSUE
01	11/12/96	RJB	RG	MODIFIED & RELEASED ON AUTOCAD
02	1/7/98	RJB	RG	NEW ITEM NO 3
03	8/27/01	SJV	WAC	REVISED NOTE NO 8
04	12/18/01	SJV	WAC	CHANGED PART # ITEM NO 3

DRAWING SCALE NONE
PLOT SCALE 1 : 1
PART# 0902-2491
DRAWING STANDARD
DRAWING NUMBER D-902-2491
REV 04
N

ORIGINAL 1 CONTROLS

IP7_031126

Maintenance Enterprises, Inc
a Crown Enterprises Company

ADVANCED BURNER TECHNOLOGIES

Installation of Low NOx Burners, & Turning Vanes

Intermountain Power Unit #3

MEI Proposal # M-1912-MS

ORIGINAL

IP7_031127

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II Safety (3 Years) & Insurance

III P-3 Schedule

IV Subcontractor List

V T & M Rates

VI Stamps "R", "S", "U"

VII Exceptions

VIII Clarifications

Maintenance Enterprises, Inc

a Crown Enterprises Company

August 20, 2003

Mr. Sal Ferrara
Project Manager
Advanced Burner Technologies
350 Main Street
Suite 5
Bedminster, New Jersey 07921

RE: **Intermountain Power Service Corp. – Unit #2**
Low NOx Project – Installation of 48 New Burners & Turning Vanes
MEI Proposal #M-1912-MS

Dear Sal:

MEI is pleased to submit a lump sum bid in regard to the above-mentioned work. This bid is based on no ACM and/or lead paint. We have priced this bid based upon working one (1) ten hour shift, seven (7) days a week for two (2) weeks pre-outage. The outage is to be worked at one (1) ten (10) hour shift, seven (7) days a week, for twenty-eight (28) days.

Included in this bid is the following:

- Supervision
- Labor
- Pick-up trucks
- Welding supplies
- Two forklifts
- 3-8-pack welding machines
- Tool trailer
- Office trailer

Maintenance Enterprises, Inc. 703 E. Gardena Blvd. Gardena, CA 90248
Tel. (310) 329-0004 Fax. (310) 329-0006
www.Crownenterprises.com

- Lunch trailer
- Equipment & tools
- QC supervisor
- Safety supervisor
- Insulation contractor
- Electrical contractor
- Port-A-Johns
- Telephones

Items to be supplied by ABT:

- Construction drawings
- All materials
- ABT representative as needed

Items to be supplied by Intermountain Power:

- Electricity – 480 3 phase/110 – 20 AMP
- Drinking water
- Service air to 90psi
- Location to place tool trailer
- Two telephone hook-ups (bills to be paid by MEI)
- Trash dumpsters
- Metal dumpsters

There is no state, federal, city, or county taxes in this bid.

This contract is contingent up acceptance by all parties.

If you should have any questions, please do not hesitate to contact me at your convenience.

Sincerely,

Mike Simonds

Mike Simonds
General Manager
Enc

Maintenance Enterprises, Inc. 703 E. Gardena Blvd. Gardena, CA 90248
Tel. (310) 329-0004 Fax. (310) 329-0006
www.Crownenterprises.com

Maintenance Enterprises, Inc.
A Crown Enterprises company

SAFETY INFORMATION
January 1, 2003

Number of OSHA Recordable Cases	2000	4
	2001	3
	2002	3
Number of Lost Time Cases	2000	0
	2001	1
	2002	0
Number of Lost Work Days	2000	0
	2001	1
	2002	0
Number of Fatalities	2000	0
	2001	0
	2002	0
Number of Manhours Worked	2000	290,366
	2001	1,089,167
	2002	450,544
Total OSHA Recordable Incident Rate	2000	2.76
	2001	0.55
	2002	1.33
Lost Time Incident Rate	2000	0.00
	2001	0.18
	2002	0.00
Worker's Compensation Experience Modifier	2000	0.58
	2001	0.74
	2002	0.70

ACORD CERTIFICATE OF LIABILITY INSURANCE

OP ID GB MAINT-1

DATE (MM/DD/YY) 11/04/02

PRODUCER

Hibernia Rosenthal
411 Colonial Drive
Baton Rouge LA 70896-6068
Phone: 225-381-8812 Fax: 225-381-8510

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURERS AFFORDING COVERAGE

INSURED

Maintenance Enterprises, Inc.
c/o Crown Enterprises, Inc.
Debbie Dabadie
PO Box 120
White Castle LA 70788

INSURER A	Steadfast Insurance Co.
INSURER B	Steadfast Insurance Co.
INSURER C	Zurich American Insurance Co.
INSURER D	
INSURER E	Firemans Fund Insurance Co.

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	GENERAL LIABILITY X COMMERCIAL GENERAL LIABILITY CLAIMS MADE / X OCCUR X Pollution GEN'L AGGREGATE LIMIT APPLIES PER: POLICY / PRO-JECT / LOC	BOG9307179-00	11/01/02	11/01/03	EACH OCCURRENCE	$ 1,000,000.
					FIRE DAMAGE (Any one fire)	$ 100,000
					MED EXP (Any one person)	$ 5,000.
					PERSONAL & ADV INJURY	$ 1,000,000.
					GENERAL AGGREGATE	$ 2,000,000.
					PRODUCTS - COMP/OP AGG	$ 2,000,000.
C	AUTOMOBILE LIABILITY ANY AUTO ALL OWNED AUTOS X SCHEDULED AUTOS HIRED AUTOS NON-OWNED AUTOS	BAPP9307177-00	11/01/02	11/01/03	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
					BODILY INJURY (Per person)	$
					BODILY INJURY (Per accident)	$
					PROPERTY DAMAGE (Per accident)	$
	GARAGE LIABILITY ANY AUTO				AUTO ONLY - EA ACCIDENT	$
					OTHER THAN AUTO ONLY: EA ACC	$
					AGG	$
B	EXCESS LIABILITY X OCCUR / CLAIMS MADE DEDUCTIBLE X RETENTION $ 10000	EOG9307186-00	11/01/02	11/01/03	EACH OCCURRENCE	$ 5000000
					AGGREGATE	$ 5000000
						$
						$
						$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY				WC STATUTORY LIMITS / OTHER	
					E.L. EACH ACCIDENT	$
					E.L. DISEASE - EA EMPLOYEE	$
					E.L. DISEASE - POLICY LIMIT	$
	OTHER Rent/Leased Equip	MXI97851593	11/10/02	11/10/03	Per Item Per Occur	500,000 1,000,000

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS

Policies include Blanket Waiver of Subrogation, Additional Insureds and 30 Day Notice of Cancellation where required by written contract.

CERTIFICATE HOLDER | Y | ADDITIONAL INSURED; INSURER LETTER: ____

BLANK-1

SAMPLE

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

Brenda Riddle

© ACORD CORPORATION 1988

ACORD CERTIFICATE OF INSURANCE

DATE (MM/DD/YY) 08-06-98

PRODUCER

LCTA - SIF
P.O. Box 1709
Baton Rouge, LA 70821-1709

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

COMPANIES AFFORDING COVERAGE

COMPANY A: LA Commerce & Trade Assoc.-SIF

INSURED

Maintenance Enterprises, Inc.
P.O. Box 120
White Castle, LA 70788

COMPANY B:

COMPANY C:

COMPANY D:

COVERAGES

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
	GENERAL LIABILITY				GENERAL AGGREGATE	$
	COMMERCIAL GENERAL LIABILITY				PRODUCTS-COMP/OP AGG	$
	CLAIMS MADE / OCCUR				PERSONAL & ADV INJURY	$
	OWNER'S & CONT PROT				EACH OCCURRENCE	$
					FIRE DAMAGE (Any one fire)	$
					MED EXP (Any one person)	$
	AUTOMOBILE LIABILITY				COMBINED SINGLE LIMIT	$
	ANY AUTO					
	ALL OWNED AUTOS				BODILY INJURY (Per person)	$
	SCHEDULED AUTOS					
	HIRED AUTOS				BODILY INJURY (Per accident)	$
	NON-OWNED AUTOS					
					PROPERTY DAMAGE	$
	GARAGE LIABILITY				AUTO ONLY - EA ACCIDENT	$
	ANY AUTO				OTHER THAN AUTO ONLY:	
					EACH ACCIDENT	$
					AGGREGATE	$
	EXCESS LIABILITY				EACH OCCURRENCE	$
	UMBRELLA FORM				AGGREGATE	$
	OTHER THAN UMBRELLA FORM					$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY				STATUTORY LIMITS	
A	THE PROPRIETOR/ PARTNERS/EXECUTIVE OFFICERS ARE: INCL / EXCL	10536	01-01-98	Continuous until Cancelled	EACH ACCIDENT	$ 1,000,000
					DISEASE - POLICY LIMIT	$ 1,000,000
					DISEASE - EACH EMPLOYEE	$ 1,000,000
	OTHER					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS

Excess Carrier: National Union Fire Insurance Company of Louisiana

CERTIFICATE HOLDER

SAMPLE

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO MAIL SUCH NOTICE SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE COMPANY, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

William H Cormier

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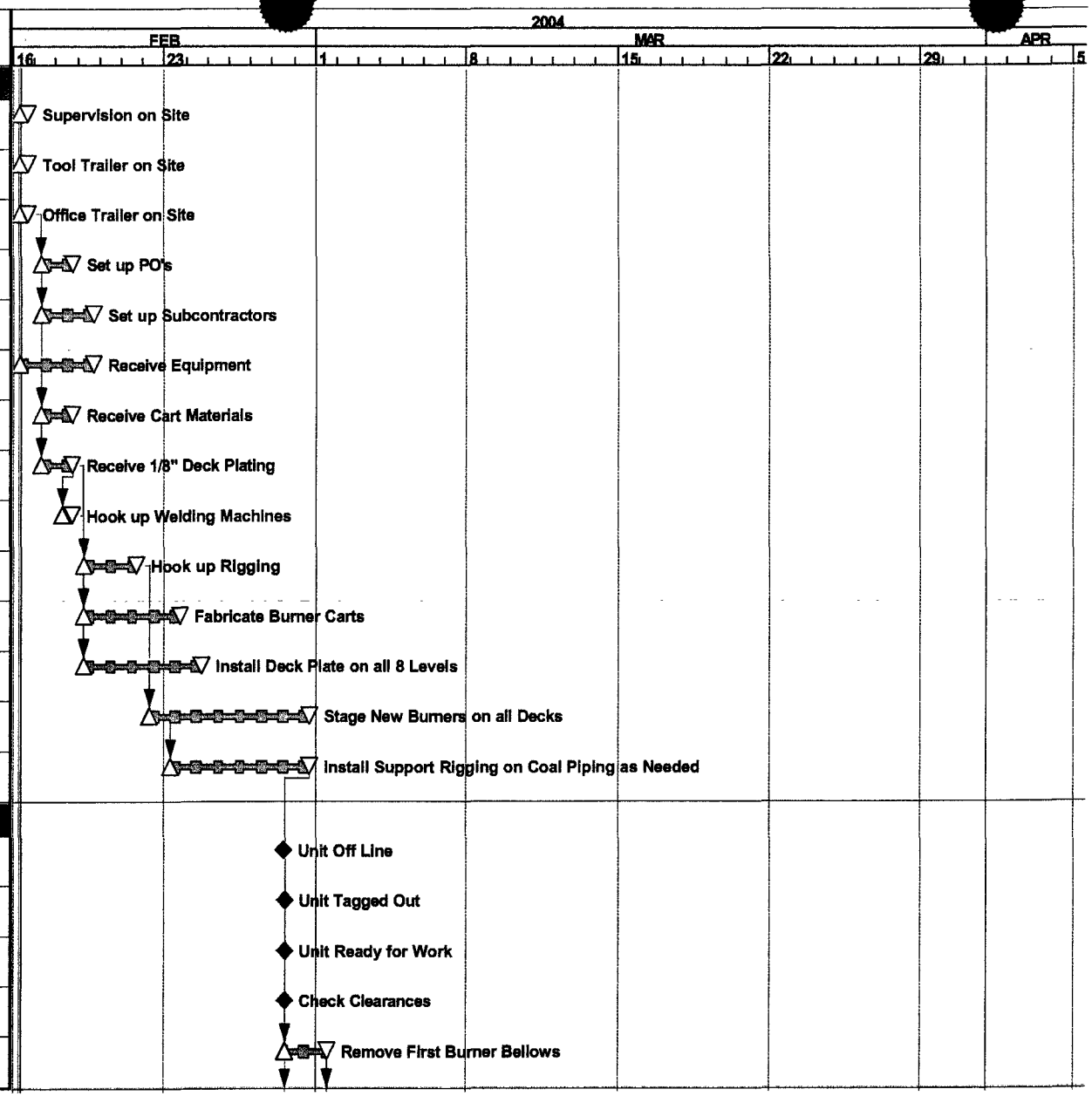
IP7_031133

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
Pre-Shutdown Activities				
00010	Supervision on Site	10	16FEB04 07:00	16FEB04 16:59
00020	Tool Trailer on Site	10	16FEB04 07:00	16FEB04 16:59
00030	Office Trailer on Site	10	16FEB04 07:00	16FEB04 16:59
00040	Set up PO's	20	17FEB04 07:00	18FEB04 16:59
00050	Set up Subcontractors	30	17FEB04 07:00	19FEB04 16:59
00060	Receive Equipment	40	16FEB04 07:00	19FEB04 16:59
00070	Receive Cart Materials	20	17FEB04 07:00	18FEB04 16:59
00080	Receive 1/8" Deck Plating	20	17FEB04 07:00	18FEB04 16:59
00090	Hook up Welding Machines	10	18FEB04 07:00	18FEB04 16:59
00100	Hook up Rigging	30	19FEB04 07:00	21FEB04 16:59
00110	Fabricate Burner Carts	50	19FEB04 07:00	23FEB04 16:59
00120	Install Deck Plate on all 8 Levels	60	19FEB04 07:00	24FEB04 16:59
00130	Stage New Burners on all Decks	80	22FEB04 07:00	29FEB04 16:59
00140	Install Support Rigging on Coal Piping as Needed	70	23FEB04 07:00	29FEB04 16:59
Shutdown Activities				
00150	Unit Off Line	0	26FEB04 12:00*	
00160	Unit Tagged Out	0	26FEB04 13:00*	
00170	Unit Ready for Work	0	26FEB04 13:00*	
00180	Check Clearances	0	26FEB04 13:00*	
00181	Remove First Burner Bellows	20	26FEB04 13:00	01MAR04 12:59



Start Date	16FEB04 07:00
Finish Date	26MAR04 15:59
Data Date	16FEB04 07:00
Run Date	20AUG03 10:52

Early Bar
Progress Bar

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1912

Sheet 1 of 5

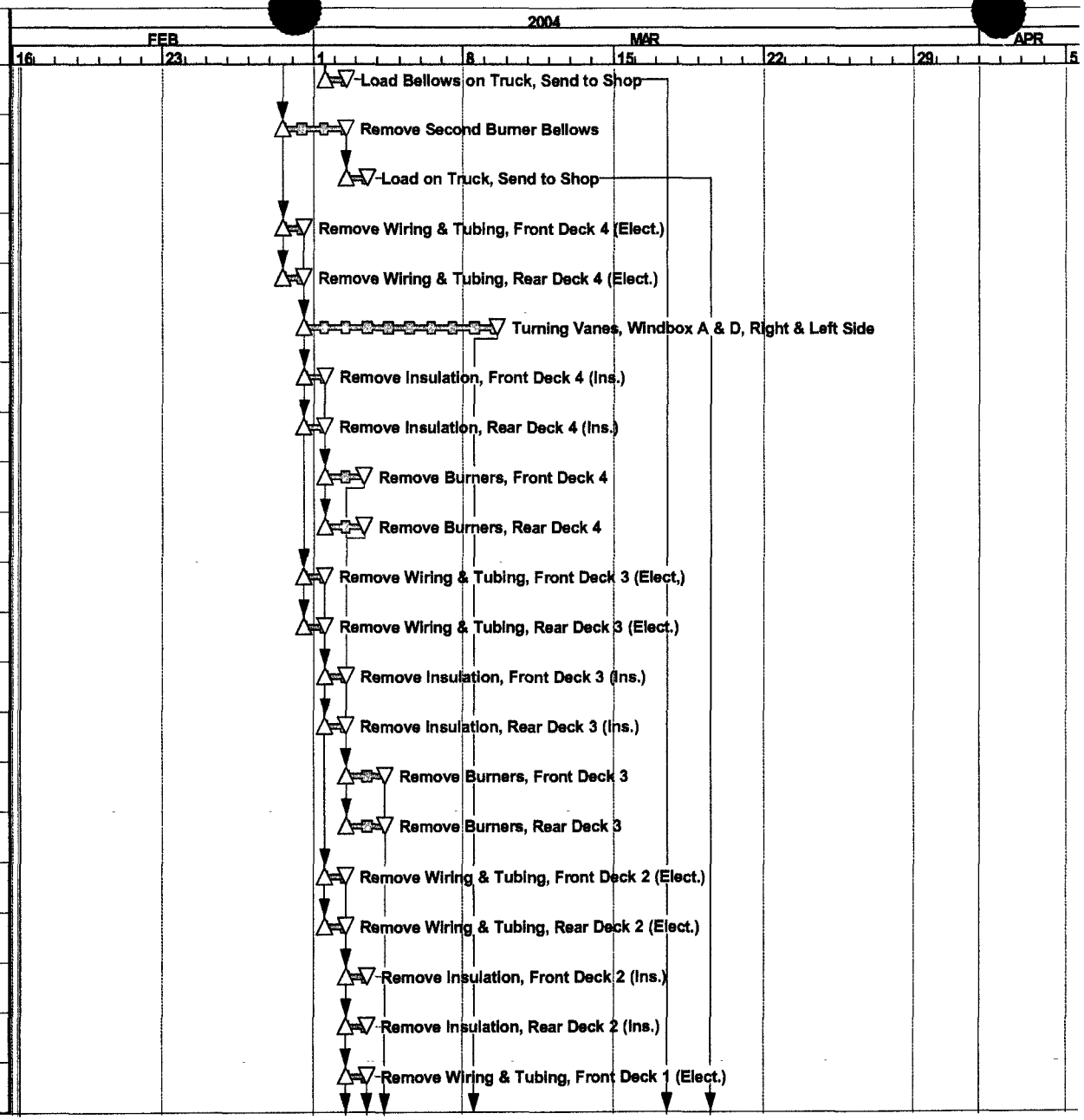
Intermountain Power - Delta, Utah

Lo-NOx Burner Replacement

Date	Revision	Checked	Approved

IP7_031134

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
00182	Load Bellows on Truck, Send to Shop	10	01MAR04 13:00	02MAR04 12:59
00183	Remove Second Burner Bellows	30	28FEB04 13:00	02MAR04 12:59
00184	Load on Truck, Send to Shop	10	02MAR04 13:00	03MAR04 12:59
00190	Remove Wiring & Tubing, Front Deck 4 (Elect.)	10	28FEB04 13:00	29FEB04 12:59
00200	Remove Wiring & Tubing, Rear Deck 4 (Elect.)	10	28FEB04 13:00	29FEB04 12:59
00201	Turning Vanes, Windbox A & D, Right & Left Side	90	29FEB04 13:00	09MAR04 12:59
00210	Remove Insulation, Front Deck 4 (Ins.)	10	29FEB04 13:00	01MAR04 12:59
00220	Remove Insulation, Rear Deck 4 (Ins.)	10	29FEB04 13:00	01MAR04 12:59
00230	Remove Burners, Front Deck 4	15	01MAR04 13:00	03MAR04 07:59
00240	Remove Burners, Rear Deck 4	15	01MAR04 13:00	03MAR04 07:59
00250	Remove Wiring & Tubing, Front Deck 3 (Elect.)	10	29FEB04 13:00	01MAR04 12:59
00260	Remove Wiring & Tubing, Rear Deck 3 (Elect.)	10	29FEB04 13:00	01MAR04 12:59
00270	Remove Insulation, Front Deck 3 (Ins.)	10	01MAR04 13:00	02MAR04 12:59
00280	Remove Insulation, Rear Deck 3 (Ins.)	10	01MAR04 13:00	02MAR04 12:59
00290	Remove Burners, Front Deck 3	15	02MAR04 13:00	04MAR04 07:59
00300	Remove Burners, Rear Deck 3	15	02MAR04 13:00	04MAR04 07:59
00310	Remove Wiring & Tubing, Front Deck 2 (Elect.)	10	01MAR04 13:00	02MAR04 12:59
00320	Remove Wiring & Tubing, Rear Deck 2 (Elect.)	10	01MAR04 13:00	02MAR04 12:59
00330	Remove Insulation, Front Deck 2 (Ins.)	10	02MAR04 13:00	03MAR04 12:59
00340	Remove Insulation, Rear Deck 2 (Ins.)	10	02MAR04 13:00	03MAR04 12:59
00350	Remove Wiring & Tubing, Front Deck 1 (Elect.)	10	02MAR04 13:00	03MAR04 12:59



Start Date	16FEB04 07:00
Finish Date	26MAR04 15:59
Data Date	16FEB04 07:00
Run Date	20AUG03 10:52

Early Bar
Progress Bar

1912

Sheet 2 of 5

Intermountain Power - Delta, Utah

Lo-NOx Burner Replacement

Date	Revision	Checked	Approved

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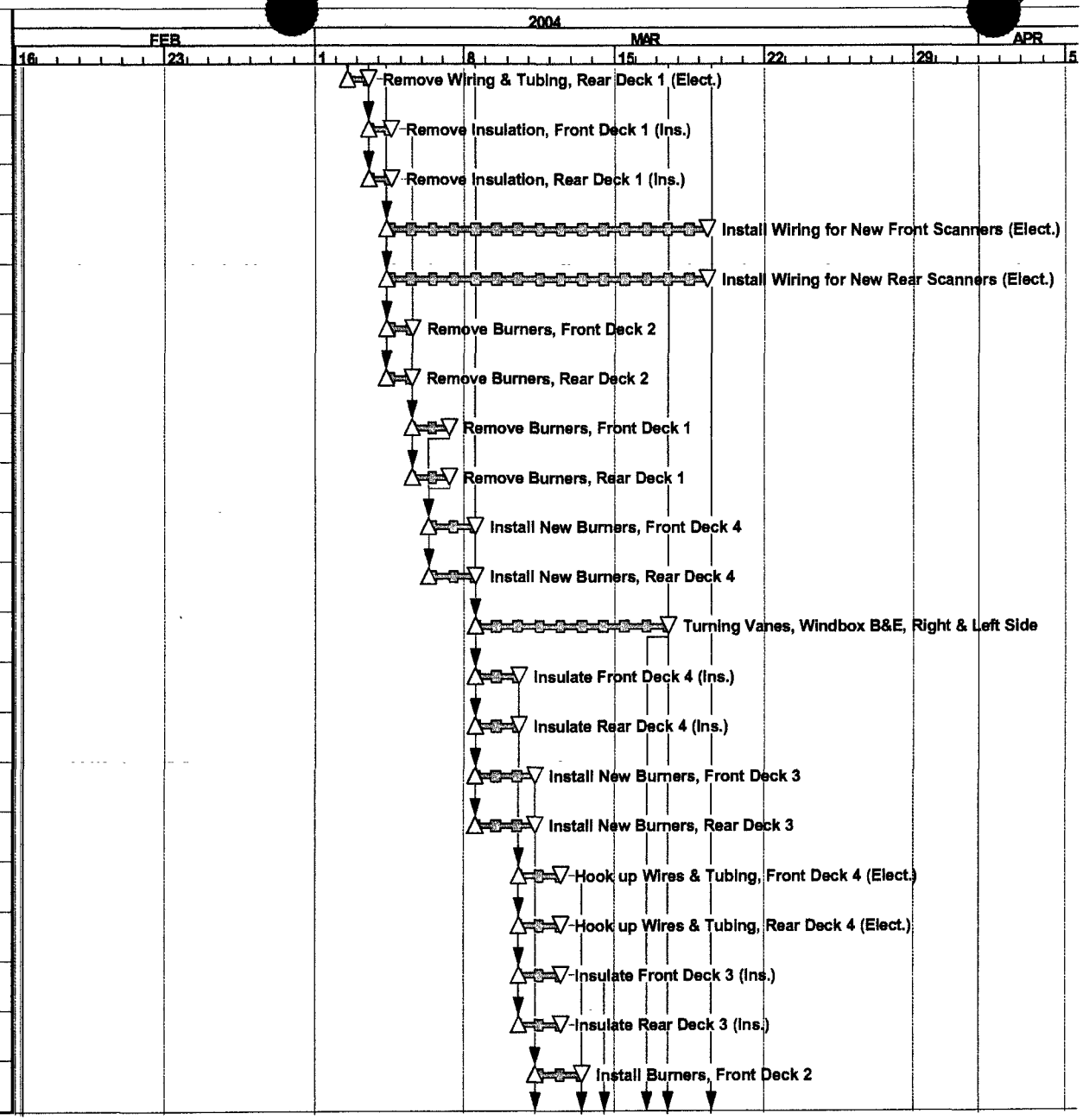
IP7_031135

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
00360	Remove Wiring & Tubing, Rear Deck 1 (Elect.)	10	02MAR04 13:00	03MAR04 12:59
00370	Remove Insulation, Front Deck 1 (Ins.)	10	03MAR04 13:00	04MAR04 12:59
00380	Remove Insulation, Rear Deck 1 (Ins.)	10	03MAR04 13:00	04MAR04 12:59
00390	Install Wiring for New Front Scanners (Elect.)	150	04MAR04 08:00	19MAR04 07:59
00400	Install Wiring for New Rear Scanners (Elect.)	150	04MAR04 08:00	19MAR04 07:59
00410	Remove Burners, Front Deck 2	15	04MAR04 08:00	05MAR04 12:59
00420	Remove Burners, Rear Deck 2	15	04MAR04 08:00	05MAR04 12:59
00430	Remove Burners, Front Deck 1	15	05MAR04 13:00	07MAR04 07:59
00440	Remove Burners, Rear Deck 1	15	05MAR04 13:00	07MAR04 07:59
00450	Install New Burners, Front Deck 4	25	06MAR04 08:00	08MAR04 12:59
00460	Install New Burners, Rear Deck 4	25	06MAR04 08:00	08MAR04 12:59
00461	Turning Vanes, Windbox B&E, Right & Left Side	90	08MAR04 13:00	17MAR04 12:59
00470	Insulate Front Deck 4 (Ins.)	20	08MAR04 13:00	10MAR04 12:59
00480	Insulate Rear Deck 4 (Ins.)	20	08MAR04 13:00	10MAR04 12:59
00490	Install New Burners, Front Deck 3	25	08MAR04 13:00	11MAR04 07:59
00500	Install New Burners, Rear Deck 3	25	08MAR04 13:00	11MAR04 07:59
00510	Hook up Wires & Tubing, Front Deck 4 (Elect.)	20	10MAR04 13:00	12MAR04 12:59
00520	Hook up Wires & Tubing, Rear Deck 4 (Elect.)	20	10MAR04 13:00	12MAR04 12:59
00530	Insulate Front Deck 3 (Ins.)	20	10MAR04 13:00	12MAR04 12:59
00540	Insulate Rear Deck 3 (Ins.)	20	10MAR04 13:00	12MAR04 12:59
00550	Install Burners, Front Deck 2	25	11MAR04 08:00	13MAR04 12:59



Start Date	16FEB04 07:00
Finish Date	26MAR04 15:59
Data Date	16FEB04 07:00
Run Date	20AUG03 10:52

Early Bar
Progress Bar

1912

Sheet 3 of 5

Intermountain Power - Delta, Utah

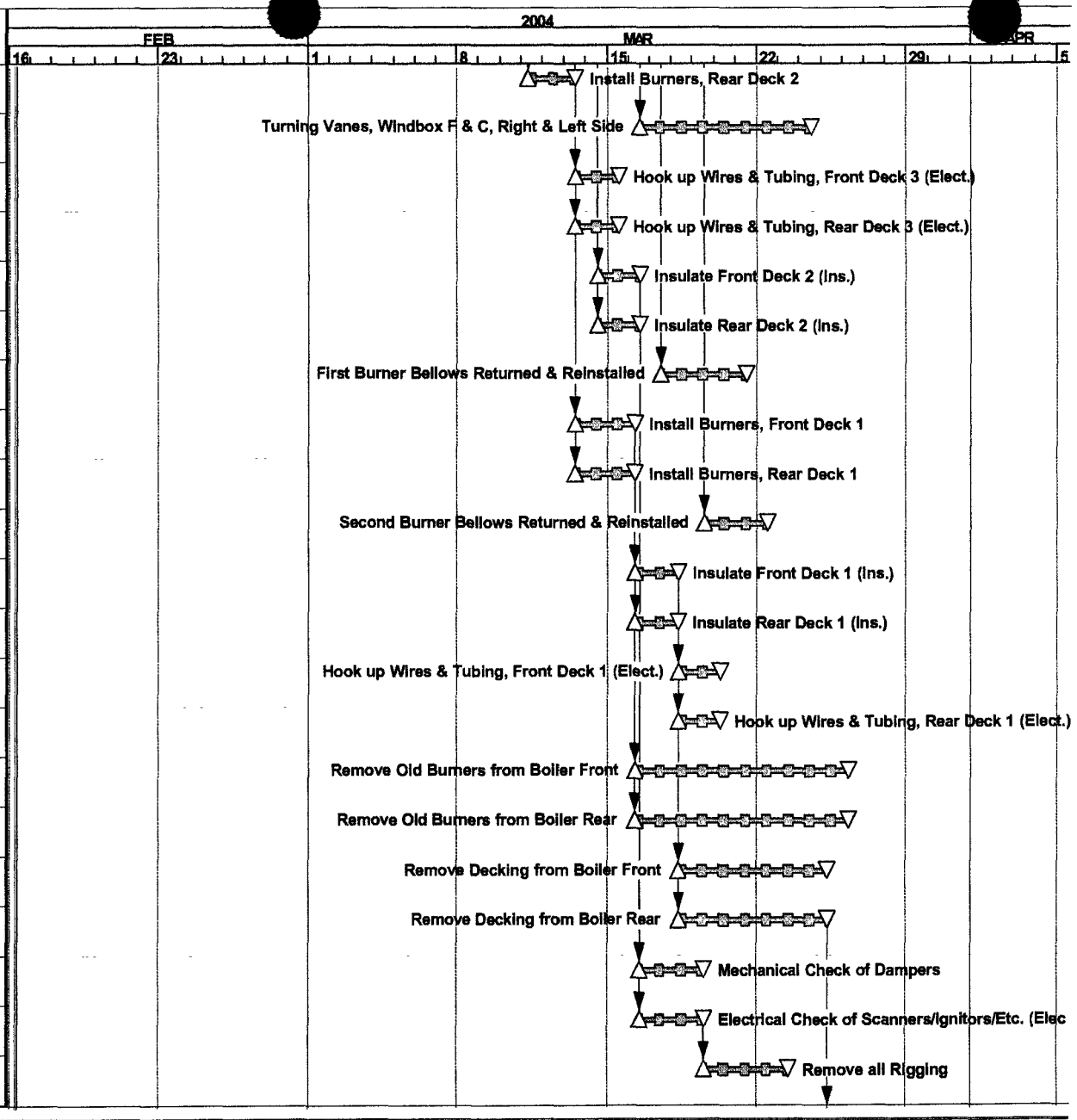
Lo-NOx Burner Replacement

Date	Revision	Checked	Approved

© Primavera Systems, Inc.

IP7_031136

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
00560	Install Burners, Rear Deck 2	25	11MAR04 08:00	13MAR04 12:59
00561	Turning Vanes, Windbox F & C, Right & Left Side	80	16MAR04 13:00	24MAR04 12:59
00570	Hook up Wires & Tubing, Front Deck 3 (Elect.)	20	13MAR04 13:00	15MAR04 12:59
00580	Hook up Wires & Tubing, Rear Deck 3 (Elect.)	20	13MAR04 13:00	15MAR04 12:59
00590	Insulate Front Deck 2 (Ins.)	20	14MAR04 13:00	16MAR04 12:59
00600	Insulate Rear Deck 2 (Ins.)	20	14MAR04 13:00	16MAR04 12:59
00601	First Burner Bellows Returned & Reinstalled	40	17MAR04 13:00	21MAR04 12:59
00610	Install Burners, Front Deck 1	25	13MAR04 13:00	16MAR04 07:59
00620	Install Burners, Rear Deck 1	25	13MAR04 13:00	16MAR04 07:59
00621	Second Burner Bellows Returned & Reinstalled	30	19MAR04 13:00	22MAR04 12:59
00630	Insulate Front Deck 1 (Ins.)	20	16MAR04 08:00	18MAR04 07:59
00640	Insulate Rear Deck 1 (Ins.)	20	16MAR04 08:00	18MAR04 07:59
00650	Hook up Wires & Tubing, Front Deck 1 (Elect.)	20	18MAR04 08:00	20MAR04 07:59
00660	Hook up Wires & Tubing, Rear Deck 1 (Elect.)	20	18MAR04 08:00	20MAR04 07:59
00670	Remove Old Burners from Boiler Front	100	16MAR04 08:00	26MAR04 07:59
00680	Remove Old Burners from Boiler Rear	100	16MAR04 08:00	26MAR04 07:59
00690	Remove Decking from Boiler Front	70	18MAR04 08:00	25MAR04 07:59
00700	Remove Decking from Boiler Rear	70	18MAR04 08:00	25MAR04 07:59
00710	Mechanical Check of Dampers	30	16MAR04 13:00	19MAR04 12:59
00720	Electrical Check of Scanners/Ignitors/Etc. (Elec	30	16MAR04 13:00	19MAR04 12:59
00730	Remove all Rigging	40	19MAR04 13:00	23MAR04 12:59



Start Date	16FEB04 07:00
Finish Date	26MAR04 15:59
Data Date	16FEB04 07:00
Run Date	20AUG03 10:52

Early Bar
Progress Bar

1912

Sheet 4 of 5

Intermountain Power - Delta, Utah

Lo-NOx Burner Replacement

Date	Revision	Checked	Approved

© Primavera Systems, Inc.

IP7_031138

SUBCONTRACTORS

Drexal Power - Electrical

Petro-Chem – Insulation

Maintenance Enterprises, Inc

a Crown Enterprises Company

TIME & MATERIAL RATE SCHEDULE

Intermountain Power – Delta, UT
August 20, 2003

	ST	OT
Project Manager	60.41	82.31
Superintendent	48.60	65.90
Planner/Scheduler	55.42	75.60
Cost Engineer	38.27	54.04
Quality Control	40.66	55.08
Supervisor/General Foreman	41.11	54.48
Safety	40.66	55.08
Timekeeper	22.64	31.28
Working Foreman	39.11	52.48
Material Control	31.49	43.60
"AA" Welder	37.11	50.48
"A" Welder	34.01	46.22
"B" Welder	29.37	39.84
"A" Pipe Fitter	32.46	44.10
"B" Pipe Fitter	29.37	39.84
"A" Boilermaker	30.92	41.97
"B" Boilermaker	27.82	37.71
"A" Rigger	30.92	41.97
"B" Rigger	27.82	37.71
Helper	23.17	31.32
Fire watch/Hole Watch	18.53	24.93
Labor	18.53	24.93

NOTE: The Above Rates Are Valid For (Six) 6 Months.

Overtime/Holiday Pay:

- All hours worked over eight (8) hours each day are considered overtime.
- All hours worked on Saturday, Sunday or holidays are considered overtime.
- Contractor's normal workweek is a sixty (60) hour week [six (6) ten (10) hour shifts]...However, Contractor is receptive to any work day/work week required for a specific job, based upon prior mutual agreement.
- When a twelve (12) hour shift is requested by client, Contractor shall be paid for crew mealtime (i.e., receive twelve (12) hours pay for eleven and one-half (11-1/2) hours worked).

Standby Time:

- If the crew is not able to work as scheduled during any shift or is delayed for any reason beyond their control, a minimum of four (4) hours up to a maximum of ten (10) hours per day will be charged in accordance with the above rates to a maximum of sixty (60) hours per week.

Travel Time:

- Travel time required to move tools and equipment from point of origin to jobsite and return.
- Travel time by air or ground transport when approved in advance by the client. Travel time is automatically considered "COMPANY APPROVED" for any emergency call out of 72 hours or less notice and will apply to traveling both to and from the jobsite.
- Travel time is actual elapsed time from point of origin to jobsite and return to a maximum of eight (8) hours per day and will be charged at the above Straight Time rates.

Transportation:

- Vehicles for transportation to and from jobsite, charged at cost plus ten percent (10%), if required.
- Air travel versus use of ground transportation is subject to Client's prior concurrence.
- Ground transportation will be charged portal to portal at thirty two (32) cents per mile for employee owned vehicles.

Per Diem:

- At MEI's option, the rate will be $75.00 U.S. Dollars per day per person **OR** $20.00 U.S. Dollars per day per person plus, lodging will be charged at cost plus ten percent (10%). Per Diem will be charged Monday through Sunday regardless of the work schedule, unless prior agreements have been made to supercede this agreement. Per Diem will only be charged on employee's traveling over 50 miles from their legal residence.

M.E.I. Owned Equipment:

- Equipment rates include maintenance and costs associated with ownership and furnishing of such equipment.
- Weekly/Monthly rates are based on seven days around the clock operation.
- Fuel will be invoiced at cost plus ten percent (10%) if supplied by MEI.
- Pickup will be invoiced at $50.00 per day.

Personal Protective Equipment:

- Included in the labor rates will be: safety glasses, hardhats, monogoggles, ear protection and gloves.
- Any special safety equipment such as fresh air, etc. will be furnished at cost plus ten percent (10%).

Materials:

- All materials will be charged at cost plus ten percent (10%).

Consumables:

- All consumables will be charged at cost plus ten percent (10%).

Small Tools:

- Tool trailer will be charged at $35.00 per hour.
- See attached list for tools included with tool trailer. All other tools will be charged at cost plus ten percent (10%).

Subcontracts:

- Actual cost plus ten percent (10%).
- All fuel will be charged at cost plus ten percent (10%).

Third Party Equipment Rental:

- Actual cost plus ten percent (10%).

Freight:

- Freight for tool trailers, equipment, and any materials will be charged cost plus ten percent (10%) (Round trip).

Welding Procedures:

- All specialized procedures not currently in MEI's database will be charged at cost plus ten percent (10%).

Welder Testing:

- All welders having to be qualified to the new procedures will be charged at cost plus ten percent (10%), test time at above straight time rates, and mileage at $.32 per mile.

THE NATIONAL BOARD
OF
BOILER & PRESSURE VESSEL INSPECTORS

Certificate of Authorization

This is to certify that

MAINTENANCE ENTERPRISES, INC.
52410 CLARK ROAD
WHITE CASTLE, LOUISIANA 70788

is authorized to use the "R" SYMBOL in accordance with the provisions of the National Board.

The scope of Authorization is limited as follows:

REPAIRS AND/OR ALTERATIONS AT THE ABOVE LOCATION AND EXTENDED FOR FIELD REPAIRS AND/OR ALTERATIONS CONTROLLED BY THIS LOCATION

CERTIFICATE NUMBER: R-845

ISSUE DATE: MAY 30, 2002

EXPIRATION DATE: SEPTEMBER 20, 2005

Executive Director

NB 243 Rev. 2

IP7_031143

CERTIFICATE OF AUTHORIZATION

This certificate accredits the named company as authorized to use the indicated symbol of the American Society of Mechanical Engineers (ASME) for the scope of activity shown below in accordance with the applicable rules of the ASME Boiler and Pressure Vessel Code. The use of the Code symbol and the authority granted by this Certificate of Authorization are subject to the provisions of the agreement set forth in the application. Any construction stamped with this symbol shall have been built strictly in accordance with the provisions of the ASME Boiler and Pressure Vessel Code.

COMPANY:

MAINTENANCE ENTERPRISES, INC.
52410 CLARK ROAD
WHITE CASTLE, LOUISIANA 70788

SCOPE:

MANUFACTURE AND ASSEMBLY OF POWER BOILERS AT THE ABOVE LOCATION AND FIELD SITES CONTROLLED BY THE ABOVE LOCATION

AUTHORIZED: **JUNE 4, 2002**
EXPIRES: **JULY 27, 2005**
CERTIFICATE NUMBER: **29,190**

CHAIRMAN OF THE BOILER
AND PRESSURE VESSEL COMMITTEE

DIRECTOR, ACCREDITATION AND CERTIFICATION

The American Society of Mechanical Engineers

IP7_031144

CERTIFICATE OF AUTHORIZATION

This certificate accredits the named company as authorized to use the indicated symbol of the American Society of Mechanical Engineers (ASME) for the scope of activity shown below in accordance with the applicable rules of the ASME Boiler and Pressure Vessel Code. The use of the Code symbol and the authority granted by this Certificate of Authorization are subject to the provisions of the agreement set forth in the application. Any construction stamped with this symbol shall have been built strictly in accordance with the provisions of the ASME Boiler and Pressure Vessel Code.

COMPANY:

MAINTENANCE ENTERPRISES, INC.
52410 CLARK ROAD
WHITE CASTLE, LOUISIANA 70788

SCOPE:

MANUFACTURE OF PRESSURE VESSELS AT THE ABOVE LOCATION AND FIELD SITES CONTROLLED BY THE ABOVE LOCATION

AUTHORIZED: **JUNE 4, 2002**

EXPIRES: **JULY 27, 2005**

CERTIFICATE NUMBER: **31,222**

CHAIRMAN OF THE BOILER
AND PRESSURE VESSEL COMMITTEE

DIRECTOR, ACCREDITATION AND CERTIFICATION

The American Society of Mechanical Engineers

IP7_031145

EXCEPTIONS

Part B – Division B2 – Paragraph 2 – Incentives and Liquidation Damages

Early Completion:

For completion of installation of the burner and scanner systems, contractor will be awarded $25,000 per day for up to two (2) days, with a maximum possible bonus of $50,000.

Late Completion:

Liquidation damages for failure to complete insulation of all burner and scanner system components will be assessed at$100,000 per day, up to a possible total of ten (10) days delay of $1,00,000.

We feel this section should be removed or realigned equally.

CLARIFICATIONS

1. Job bid on standard rates, not prevailing wages
2. No ACM or lead paint
3. No federal, state or city taxes
4. Payment is net 30 days, billed once per month
5. Bond based upon 50% of insulation cost
6. Job bid on seven (7) days per week, ten (10) hours per day for six (6) weeks
7. Use of air pre-heaters electric hoist
8. No materials included. ABT to supply
9. No P-3 Planner included however, our office will up-date the schedule weekly if necessary
10. One (1) hour orientation included
11. No start-up support in bid
12. One (1) full-time safety man on site
13. One (1) full-time QC on site
14. No R-1 Form
15. No A-I
16. Bid bond by ABT

Burner Bid Comparisons

GE

Burners	1,732,767
Scanners	245,600
	1,978,367

0% OFA	10% OFA	**20% OFA**	7 mill operation
None	Nox = .35	**Nox = .29**	
	CO = 200	**C0 = 200**	

Minimal large boiler experience
Single control rods
No spin-vane control
Unknown personnel
Poor presentation

ABT

Burners	2,237,145
Scanners	212,515
	2,449,660

0% OFA	10% OFA	20% OFA	7 or 8 mill operation
Nox = .33	Nox = .29	Nox = .25	15% xs air @ at burner
CO = 200	CO = 200	CO = 200	

Excellent references
SA Flow Modeling
Transmitters
Best Guarantees.

B&W

Burners	2,671,445
Scanners	205,120
	2,876,565

0(10)% OFA 7 Mill	**0(10) % OFA 8 Mill**	"Unstaged" = 10 % flow
Nox = .353	**Nox = .321**	24% xs air @ boiler outlet
CO = no guarantee	**CO = no gaurantee**	22% at combustion zone
20% OFA 7 Mill	20% OFA 8 Mill	
Nox = .264	Nox = .24	
CO = no guarantee	CO = no guarantee	

RA 253 MA upgrade (no charge)
Experienced, established.
Transmitters not included.

BPI

Burners	3,856,400
Scanners	268,900
	4,125,300

15% OFA	20% OFA
Nox = .31	Nox = .321
CO = 200	

Poor guarantee
High Price

Phil Hailes
25-Aug-03

Hardware	**B&W**	**ABT**	
Burners	2,671,445	2,237,415	
ABB Scanners	205,120	212,515	
Installation	Inc w/burners	Inc w/burners	
Option 2 (SMCS)	10,000	10,000	
Option 5 (Parts)	11,288	11,288	
Emissions Gaurantees w/No Staging			
NOX	0.321	0.33	
CO	200	200	
LOI	No Change	No Change	
253 MA Burner Mat'l	x		
309 SS/ASTM 297 HE		x	
Inner Spin Adjustability	x		
Performance Bond		15,000	
Insurance Premium (BW Guess)	50,000	50,000	
60 Man-Days Support	x		
40 Man-Days Support		x	
Equalizer		20,000	
20 hrs * $1000/hr			
SA Duct Modeling		x	25,000
Transmitters		x	100,000
Total	**2,947,853**	**2,556,218**	
Difference	**15%**	**391,635**	
Comp Air Flow Meters	289,400		
w/Auto Purge	122,100		

IP7_031150

Phil Hailes
25-Aug-03

Hardware	**B&W**	**ABT**
Burners	2,671,445	2,237,415
ABB Scanners	205,120	212,515
Installation	Inc w/burners	Inc w/burners
~~Opt 2~~		10,000
~~Opt 5~~		11,288
Emissions Gaurantees w/No Staging		
NOX	0.321	0.33
CO	200	200
LOI	No Change	
~~253 MA~~ ~~RM 253~~ Burner Mat'l	x	
309 SS/ASTM		x
Inner Spin Adjustability	x	
Performance Bond		+15,000
Insurance Premium		50,000
60 Man-Days Support	x	
40 Man-Days Support		x
Equalizer		+20,000
20 hrs * $1000/hr		
SA Duct Modeling		x
Total	**2,876,565**	**2,484,930**
	Transmitter +100,000	8
Difference		**391,635**
	16%	
Local display		+ 25,000
Comp Air Flow Meters	289,400	
w/Auto Purge	122,100	

Lighter compatability.
Modeling - Materials and Engineering included? perforated plates.
Burner Materials 253 MA.
Performance Bond [$15,000 / PSC pay] Based on our % required.
Past Installation test.

IP7_031151

Phil Hailes
25-Aug-03

44%

CCV DA2 80,342

DRB 47 55,655

46,613

Opti-Flow MEI

Flame Masters

41,215

Hardware	BPI	B&W	ABT	GE-EER
Burners	3,856,400	2,671,445	2,237,415	1,978,367
Installation	1,616,800	2,994,435	1,473,130	No Bid
Sub-Total	5,473,200	5,665,880	3,710,545	1,978,367
Scanners	268,900	205,120	157,130	245,600
Installation	258,800	Inc w/burners	Inc w/burners	No Bid
Sub-Total	527,700	205,120	157,130	245,600
TOTAL	6,000,900	5,871,000	3,867,675	2,223,967

+ 55,385 for ABB Scanner.

Other Hardware				
Lighters w/Scan		480,624		
Installation		180,000		
Sub-Total		660,624		
Comp Air Flow Meters		411,500		402,000
Installation		108,800		
Sub-Total	-	520,300	-	402,000

.4 - .45 Today @ IPSC.

"Deep" Stage

NO_x @ 200ppm CO

.31 @ 15%
.26 @ 20%

.321 no Staging 8 mill

.35 @ 0%
.33 @ 1 mill OOS.

.35 @ 10%
.29 @ 20%

2,876,565 → 15% →
17% ← 2,449,930 ←
+ 15,000 Performance Bond.
2,464,930
+ 20,000 20 man-days.
2,484,545

IP7_031152

B-1A/

Spec. 45606

PART C- DIVISION C2

BIDDING DOCUMENTS - PROPOSAL SCHEDULE

1. Proposal is hereby made to furnish and deliver to IPSC **Unit 2 Low NOx Burners**, F.O.B. IPSC dock, full freight allowed in accordance with **Specifications 45606**, the following:

   a. Burner and Scanner Performance: The new burners shall provide for a continuous boiler operation of 6,900,000 pounds/hour output, 1,005°F superheat and 1,005°F reheat temperature under all operating conditions. Bidders shall state the following burner and scanner performance guarantees and submit with the bid package:

	BURNER AND SCANNER PERFORMANCE GUARANTEES		
1	Maximum Burner Nox and CO Production Under All Modes of Operation:	.321 NOx 200 ppm CO See Proposal for details	
2	Maximum Burner BTU Throughput:	203 mm BTU/HR	
3	Burner and Scanner System Temperature Tolerance and Thermal Degradation Life:	Vendor Guarantees See Proposal tab 5	pg. 5-5
4	Time Within Which Burner Register Assembly Shall Remain Fully Operable By Hand: Spec F2-3g	2 Years 4 years. See Proposal tab 5	pg. 5-6
5	Combustion Zone Stability (Ignition Location/Stability, Flame Shape/Color):	See Proposal tab 5	pg. 5-6
6	Ash Deposition (At Burner Throat, OFA Ports, and Superheat Pendants:	Not typical problem See Proposal tab 5	pg. 5-6
7	Maximum Burner Out-Of-Service Cooling Air Requirements (CFM Per Compartment):	See Proposal tab 5	pg. 5-6
8	Minimum In-Service Air Flow With Associated Emissions (Assuming 10 Percent Total Overfire Air Flow):	See Proposal tab 5	pg. 5-6
9	Maximum In-Service Air Flow With Associated Emissions (Assuming 10 Percent Total Overfire Air Flow):	See Proposal tab 5	pg. 5-6
10	Maximum Wear Life of Primary Air/Coal Path Components (Minimum Four (4) Years):	4 Years See Proposal tab 5	pg. 5-6

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b. In support of the stated guarantees, the bidder shall provide clear commitments ~~in the following areas~~: As noted in the Performance Guarantee and Commercial Comments section of the Proposal

CLEAR COMMITMENTS
The Nature of Remedial Efforts That Will Occur to Achieve Guaranteed Performance in Each Area
The Approximate or Typical Time Frame Associated with Resolution of Each of the Stated Performance Guarantees
The Company or Organization Expected to Provide the Applicable Resources Associated with the Remedial Work (Modifications, Testing, and Operational)
The Ultimate Monetary Compensation Offered by the Original Equipment Manufacturer (OEM)

2. Prices: The price or prices shall be according to the following bid pricing sheet:

BID PRICING SHEET	
Bid Price to Purchase Forty-Eight (48) Low NOx Burners, Per Specifications, Without Scanners:	$ 2,671,445
Bid Price to Purchase Forty-Eight (48) Scanners and Ancillary Hardware, Per Specifications:	$ 205,120
Bid Price to Install Forty-Eight (48) Burners and Associated Flame Detection Systems:	$ 2,994,435
TOTAL BID PRICE:	$ 5,871,000

3. Cash Terms: A discount for prompt payment is offered of TBD later percent for Contract payments made within TBD calendar days after date of acceptance or delivery and receipt of invoice.

4. Taxes: The foregoing quoted prices are exclusive of all applicable sales and use taxes.

5. Manufacturer: Babcock & Wilcox, Various sublet vendors

6. Location of Point of Manufacture: Targeted shops West Point, Miss or Akron, CH.

7. Brand and Catalog Number or Other Designation: DRB-4Z Burners, ABB, Forney, Coen, or FPS Scanners

8. Form of Business Organization: The bidder shall state below the form of its business organization.

9. Bidder is a: Corporation, organized under the laws of the state of DE. (Corporation, Partnership, Limited Partnership, Individual)

If a partnership, the bidder shall state below the names of the partners. If a corporation, the bidder shall state below the names of the president and of the secretary.

10. Person to Contact: Should IPSC desire information concerning this Proposal, please contact:

Name: Rob Tedrow Telephone No: 330-860-6089

Address: 20 S. Van Buren Ave. Barberton, Ohio 44203

(If different, the address of bidder's chief executive office is:)